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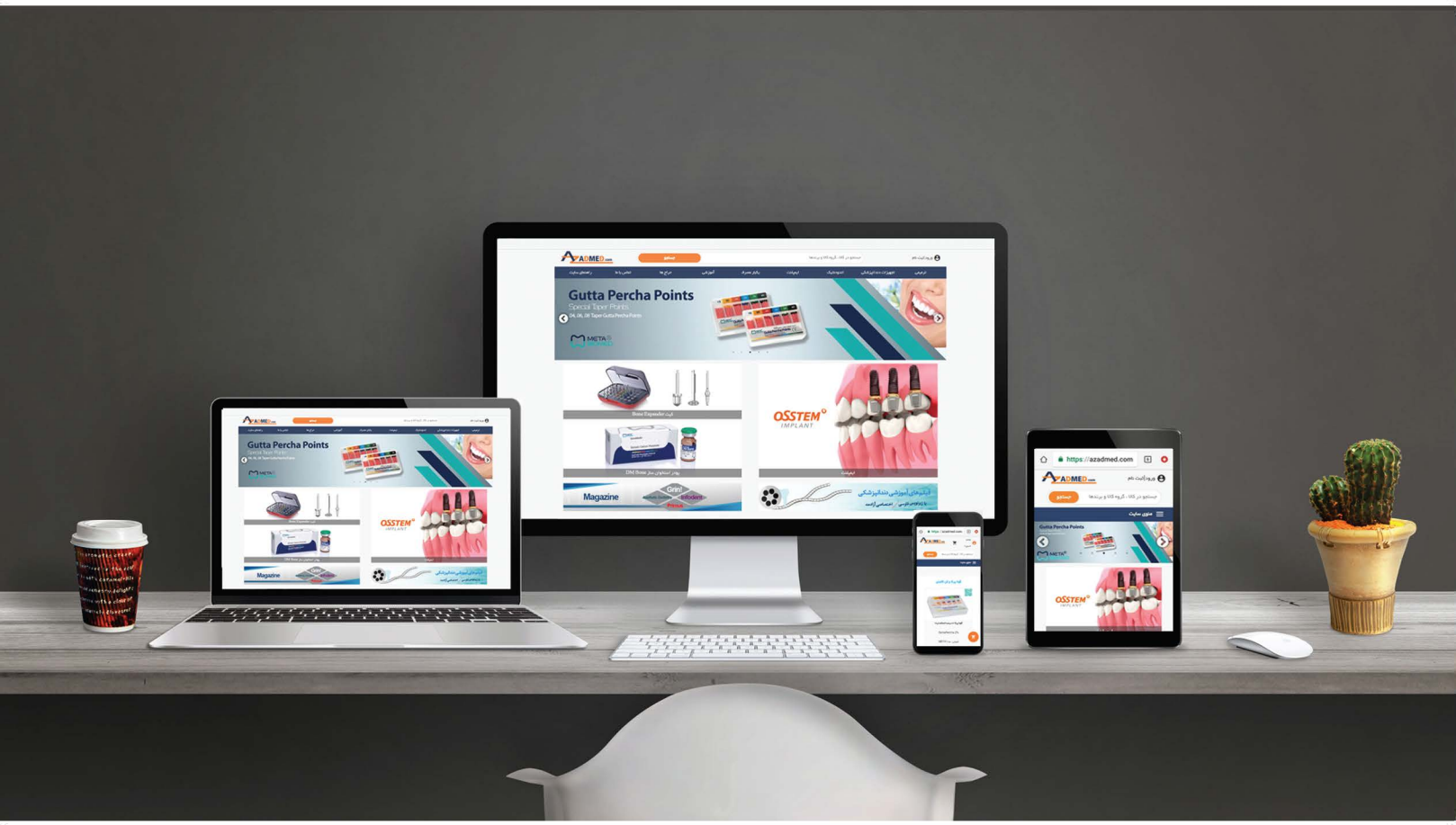

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case report

Minimally invasive dentistry (MID) concepts for the caries treatment by Er:YAG laser

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_Lights are shining in different colours in different wavelengths in different places almost all over the world.

In the past year 2010 we have been celebrating the 50th anniversary of lasers in dentistry which was the overall high light for the use of lasers in the different fields of dentistry. One flash-light during this highlight was the 12th WFLD (World Federation of Lasers Dentistry) Congress in Dubai being embedded in the largest Dental exhibition in the middle East. Further more a big number of high class national laser conferences around the world have been completing this shining impression. This has been reflected in a rising number of laser users due to the growing acceptance of this technology within the dental society.

The year 2010 was also filled with highlights of improved and new dental laser systems helping dedicated laser dentists to successfully improve their daily service towards their patients.

I wish all our dear laser users and laser interested colleagues a peacefull Christmas time and a bright shining New Year.

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Salivary flow rate before and after low level laser therapy

Authors_Sonja Pezelj-Ribari , Nataša Gržeti , Miranda Muhvi Urek, Irena Glažar, Davor Kuiš, Croatia

_Introduction

The therapy performed with lasers is often called low level laser therapy (LLLT) or just laser therapy. Several other names have been given to these lasers, such as soft laser and low intensity level laser whereas the therapy has been referred to as biostimulation. Low level laser therapy is a non-invasive, painless and athermal therapy, based on biological estimulative-regenerative, anti-inflammatory and analgesic effects. LLLT also appears to have a virustatic and bacteriostatic effect. Some explanation of analgesic effect of LLLT are: it increases ATP production, improves local microcirculation, increases lymphatic flow, increased serotonin and endorphins, increased anti-inflammatory effects through reduced prostaglandin synthesis.[1]

In vitro data suggest that LLLT facilitates collagen synthesis, keratinocyte cell motility, and growth factor release and transforms fibroblasts to myofibroblasts.[1-4]

Low level laser light is compressed light of a wavelength from the cold, red part of the spectrum of electromagnetic radiation. It is different from natural light in that it is one precise color; it is coherent, monochromatic and polarized. These properties allow laser light to penetrate the surface of the skin or mucosa with no heating effect and no damage. The most commercially available lasers are the helium-neon (He-Ne), emitting wavelengths of 632.8 nm, and the semiconductor diodes, such as gallium-arsenide (GaAs) and gallium-aluminum-arsenide (GaAlAs), emitting wavelengths of 650 and 830 nm, respectively.[5]

LLLT has also beene used to stimulate bone formation by increasing osteoblastic activity, vascularization, organization of collagenous fibers and ATP levels.[5]

In recent studies, many authors have reprted significant pain reduction with LLLT in acute and chronic musculoskeletal pain and also many authors have reported significant pain and symptoms of inflammation reduction with LLLT in radiotherapy-induced oral mucositis and xerostomia in oral cancer patients , and severe pain in patients submitted to hematopoietic stem cell transplantation.[6,7]

In our previous research we investigated therapeutic response by determing the level of proinflammatory cytokines TNF-alpha and IL-6 in whole unstimulated saliva in patents with denture stomatitis before and after LLLT.[7]

Fig. 1_Salivary flow rate before and after LLLT. * Denotes significant difference between groups P < 0.001. LLLT—low level laser therapy.

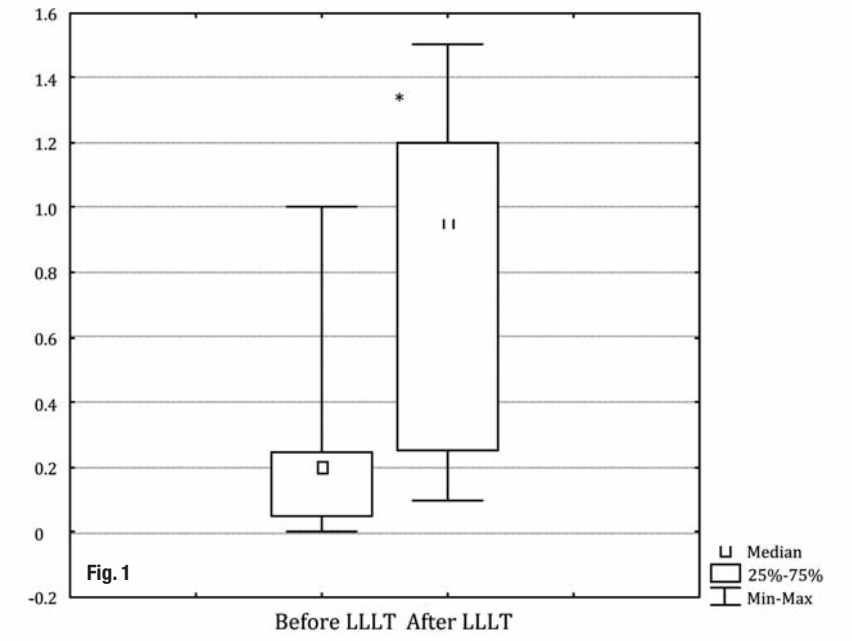

Fig. 1

Xerostomia is frequently associated with decrease in the flow rate of saliva. The measurement of salivary flow is basic to understanding of the process of secretion and to our assesment of conditions and disease which lead to salivary hypofunction.[8] Xerostomia is not a disease, but it may be a symptom of various medical conditions, a side effect of a radiation to the head and neck, or a side effect of a wide variety of medications. It may or may not be associated with decreased salivary gland function. Xerostomia is often a contributing factor for both minor and serious health problems. It can affect nutrition and dental, as well as psychological, health. Some common problems associated with xerostomia include a constant sore throat, burning sensation, difficulty speaking and swallowing, hoarseness and/or dry nasal passages.[9] The management of xerostomia will include the identification of the underlying cause. For many patients little can be done to alter the underlying cause. For those whose xerostomia is related to medication use, effective symptomatic treatment may be important to maintain compliance with their medication regime. Symptomatic treatment typically includes four areas: increasing existing saliva flow, replacing lost secretions, control of dental caries and specific measures such as treatment of infections.[10]

Some investigators had effect of LLLT on mucositis and temporomandibular joint dysfunction.[11,12] LLLT may also have an effect on salivary glands so it is important to know the effects of this therapy on parotid and submandibular gland tissues.

The aim of this study was to investigate is it LLLT able to increase salivary flow rate.

_Materials and methods

A sample consisting of 20 consecutive subjects were selected on a voluntary basis from patients who presented for diagnosis and treatment of xerostomia at the Oral Medicine Unit of the Medical Faculty University of Rijeka. All subjects were informed of the aims and procedures of the research, as well as of the fact that their medical data would be later used in the analysis. The Ethics Committee of Medical Faculty of Rijeka (University of Rijeka) approved this study protocol. Only those subjects who have given a written permission in form of an informed consent were included. Each subject completed a questionnaire for demographic and health information.

The clinical examination was performed according to the standard clinical criteria. We mesured the whole saliva.

After initial evaluation and diagnosis, the patients were divided in two groups:
Group 1: before receiving LLLT
Group 2: after receiving LLLT

Xerostomia may be diagnosed with the aid of salivary collection tests (sialometry).Salivary flow rate should be measured by standardized techniques. As salivary secretion fluctuates between minimal and maximal rates during the day, it is important to assess the salivary secretion consistently at an established time of the day, in order to properly examine the evolution of the condition and its treatment in every patient. Whole saliva can be collected by spitting, blotting, suctioning or draining the oral fluid. The normal flow rate for unstimulated, "resting" whole saliva is 0.3 to 0.5 ml/min.; for stimulated saliva, 1 to 2 ml/min. Values less than 0.1 ml/min. are typically considered xerostomic, although reduced flow may not always be associated with complaints of dryness.[9] We measured the whole saliva.

The whole unstimulated saliva was collected between 9:00 and 11:00 am using standard techniques described by Navazesh.[13] Participants were refrained from eating, drinking, using chewing gum, etc, for at least 1,5 hours prior to evaluation. Saliva specimens were collected from each participant in sitting position, before and after LLLT. Samples were obtained by requesting subjects to swallow first, tilt their head forward, and expectorate all

Tab. 1_Descriptive statistics of salivary flow rate before and after LLLT. (S.D.—standard deviation; LLLT—low level laser therapy)

Group	Mean (ml /5 min.)	S.D. (ml /5 min.)	Median (ml /5 min.)	Minimum (ml /5 min.)	Maximum (ml /5 min.)	Lower Quartile (ml /5 min.)	Upper Quartile (ml /5 min.)
Before LLLT	0.235	0.272	0.20	0.0	1.0	0.05	0.25
After LLLT	0.825	0.504	0.95	0.1	1.5	0.25	1.2

saliva into 50 ml tubes for 5 min. without swallowing. The final volume and flow rate of saliva were determined gravimetrically (Analytical Balance, Model WTS-6001, Sartorius Corp., Long Island, NY, USA). Entire procedure was repeated after the final treatment, after four weeks. 20 subjects were treated five days in week for four consecutive weeks with a 685 nm GaAlAs (gallium-aluminium-arsenide) diode laser (Medio LASER Combi Dental, Iskra Medical, Ljubljana, Slovenia). The output of the laser was measured in 7 minutes and found to be practically constant. The laser outputs were controlled weekly using analogue power meters provided by the manufacturers. During each session, the laser treatment was delivered to the tissue by a straight optical fiber with a 1.2 mm spot size. The treatment areas, each one being a 1 cm^2 surface. Laser applied on parotide glands with 10 minutes (685 nm, continues wave, 30 mW output power, 3.0 J/cm^2). The treatment time (t) for each application point was given by the equation: t(sec) = energy (J/cm^2) x surface /cm^2/ Power (W). The average energy density delivered to the treatment areas was 3.0 J/cm^2. The effect of laser light was evaluated after the final treatment.

_Results

The sample included 20 patients (15 women and 5 men), mean age 60.25±6.27.

Salivary flow rate were measured before and after LLLT and the results are presented in table 1. Salivary flow rate after LLLT were significantly greater than salivary flow before LLLT ($P < 0.001$) (Fig. 1).

Statistical analysis

Statistical analysis of data was performed using Statistica for Windows, release 6.1 (StatSoft, Inc., Tulsa, OK). The Kolmogorov-Smirnov normality test was applied to our data. The results were compared using nonparametric Wilcoxon signed-rank test. Statistically significant difference was defined at $P < 0.05$.

_Discussion

LLLT is a non-invasive light source treatment that generates a single wavelenght of light. It emits no heat, sound or vibration. Lasers with different wavelenghts, varying from 632 to 904 nm, are used in the treatment of musculoskeletal disorders. This non-invasive nature of laser biostimulation has made lasers a choice of therapy. In our previous investigation we investigated the effect of LLLT on patients with denture stomatitis.[7] We found a statistically significant reduction in the salivary levels of proinflammatory cytokines, TNF-alpha and IL-6 in patients with DS following treatment for 4 weeks with LLLT. This results may suggest that LLLT may be an efficacious choice of therapy in patients with DS. Simoes A et al.[14] made a clinical case study report on dry mouth symptoms in a patient with Sjogren's syndrome. The patient was treated with LLLT. A diode laser (780 nm, 3.8 J/cm^2, 15 mW) was used to irradiate the parotid, submandibular, and sublingual glands. The salivary flow rate and xerostomia symptoms were measured before, during, and after LLLTT. Dry mouth symptoms improved during LLLT. In this study we found that the indicence in xerostomia is significatively reduced in patients treated with LLLT.

Xerostomia is not a disease but can be a symptom of certain diseases. It can produce serious negative effects on the patients quality of life. Saliva is necessary for carrying out the normal functions of the oral cavity, such as taste, speech, and swallowing. Depending on duration and extent of salivary deficiency, severe changes of the oral mucosa and teeth will develop. Treatment of xerostomia may be performed causally (withdrawal or exchange of drugs inhibiting salivary secretion) but will often only be possible as a symptomatic therapy. For this purpose there are available today saliva surrogate solutions ('artificial saliva') and substances that stimulate the secretion of the still intact salivary gland parenchyma. In this preliminary study, with a small sample size, we found a statistically significant improvement in the salivary flow rate after the therapy with low level laser.

_Conclusion

Treatment with LLLT was an effective method to improve the quality of life of patient with xerostomia as an noninvasive, quick, safe, non-pharmaceutical intervention._

Editorial note: The literature list can be requested from the author.

_contact laser

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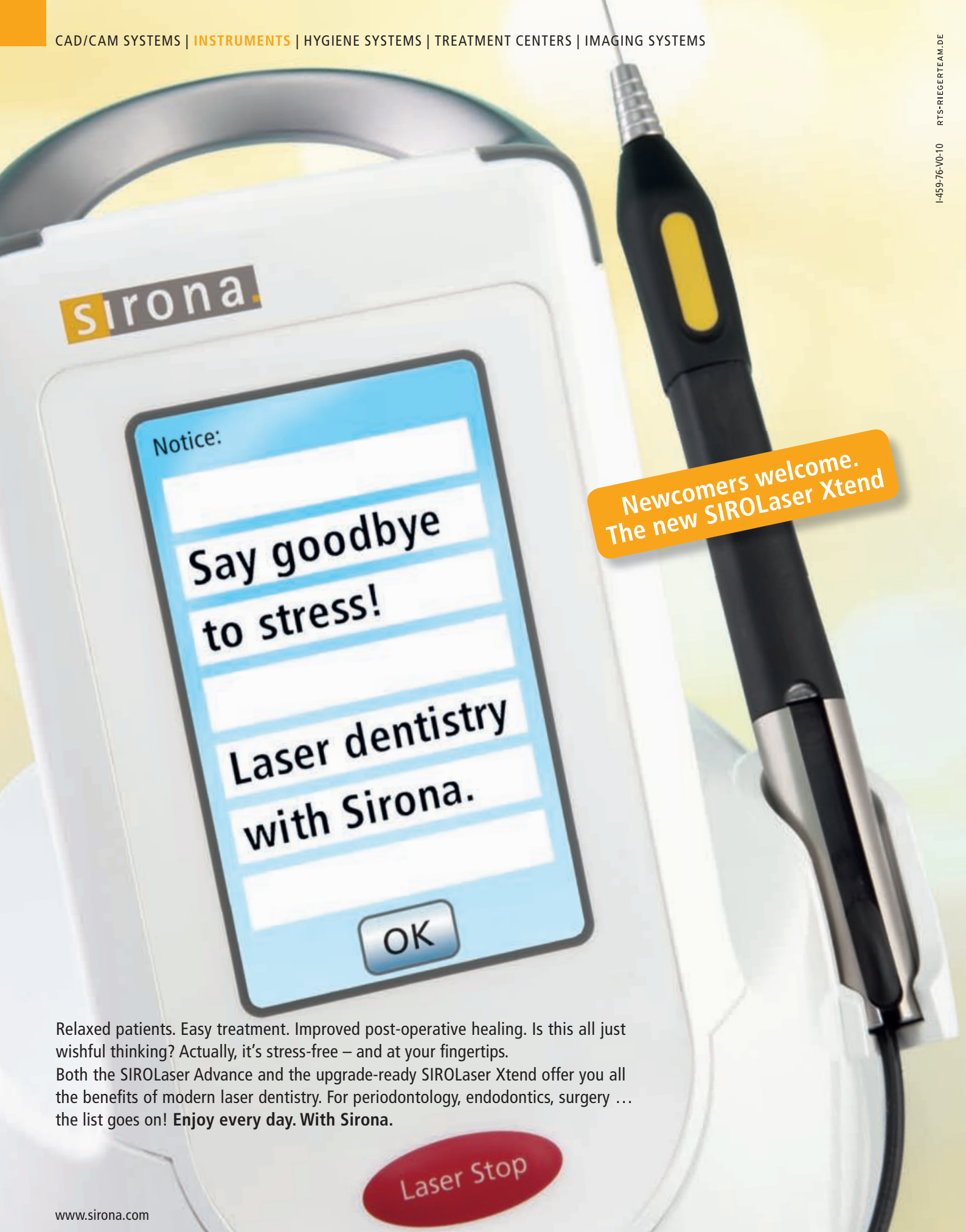

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Effect of low level laser therapy during Rapid Maxillary Expansion

Authors_Eyad Hamade, Rwaida Saimeh, Mina Mazandarani, Maziar Mir/UAE, Norbert Gutknecht/Germany

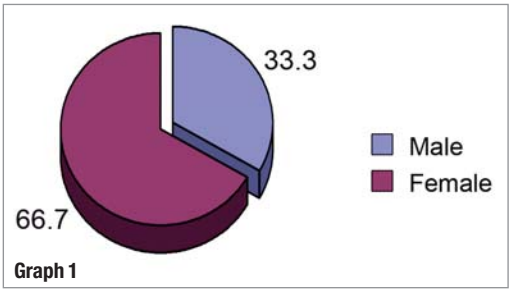
_Introduction

Orthodontic tooth movement is the result of alveolar bone remodeling due to response to mechanical stimulus at the interface with periodontal ligament. Although Wolff's law is generally considered to be a philosophical statement but states the effect that, over time, the mechanical load applied to living bone influences the structure of bone tissue. Bone remodeling can be categorized into two different types:[1,2]

_External bone remodeling, in which the outer geometry of bone tissue adapts due to change in applied forces, while the material properties remain constant;
_Internal bone remodeling in which internal structure of bone tissue remodels due to changes in applied forces, in fact, this type of bone remodeling is related to remodeling of spongy bone in which elasticity parameters of bone tissue change.

Sutures are considered as the growth sites of intramembranous bones[3,4,5,6] in the craniofacial complex. Accordingly, it is fair to assume that if sutures were not present, craniofacial bones might grow only in thickness.

The tissues surrounding sutures, such as the dura mater[7], have a significant effect on sutural patency and growth. Earlier studies have repeatedly confirmed that compressive forces applied across sutures reduce bone deposition and induce bone resorption, while tensional forces increase bone deposition. This response characteristic makes sutures important target areas for orthodontic: orthopedic appliances designed to control vertical and transverse growth of the maxilla, such as palatal expander and cervical, high-pull and protraction headgears.



Graph 1

Graph 1_The percentage of patient distribution according to gender.

The dramatic development of technology in the last decades offers a small but a powerful tool to be used in clinical trials, which is the Laser Beam. LLLT is

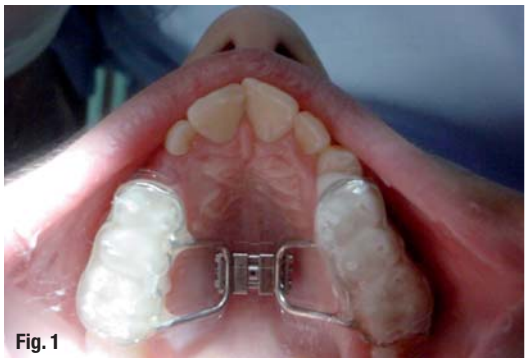


Fig. 1


Fig. 2

Fig. 1_Insertion of RME.
Fig. 2_After expansion.

a type of laser that penetrates deeply into the tissue and affects the cells. This is due to its specific wavelength and low energy level. Treatment with laser therapy is not based on heat development but on photochemical and photobiological effects in cells and tissue. Discomforting pain is a burdensome side effect accompanying orthodontic treatment and/or orthopedic procedure due to force application for movement. Several studies showed an effective pain reduction after different dental treatments using LLLT. Also it has been shown that LLLT is an effective method to prompt bone repair and modeling after surgical procedures.

_Aim of the study

_Our aim is to take advantage of the technological development, in order to increase the bone formation quality, accelerate the formation rate and therefore decreasing the relapse rate.
_Also, we hope to take our patients through a relatively short and happy orthodontic treatment journey, without a discomforting pain.

_Materials and Methods

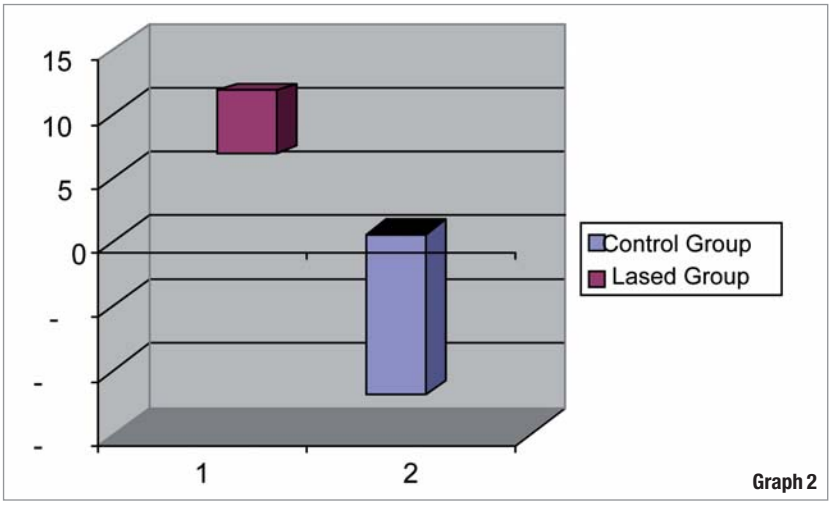
Patient selection
_Twenty patients of both genders participated in the research, and were distributed as following.
_All the patients and their legal guardians were informed of our intent to apply LLLT during orthodontic treatment and they approved to go through it (Consent).

_Orthodontic Treatment

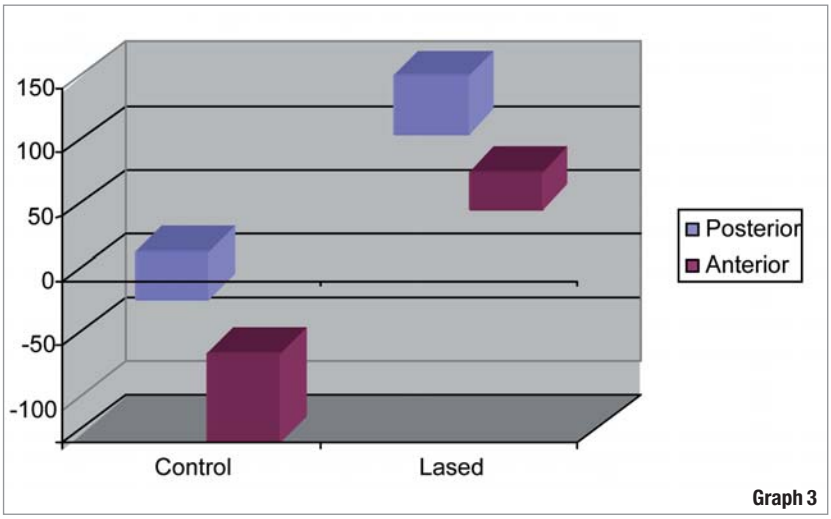
_After thorough clinical examination, the following diagnostic tools were obtained for each patient:

1- X-rays
_A-Panoramic view.
_B-Lateral Cephalometric View.
_C-Antero-Posterior view.
_D-Upper maxillary CT scan with 3 mm sections thickness.
_2-Appropriate Photographs.
_3-Model cast.
_In addition, the followings were taken at the end of the expansion period:

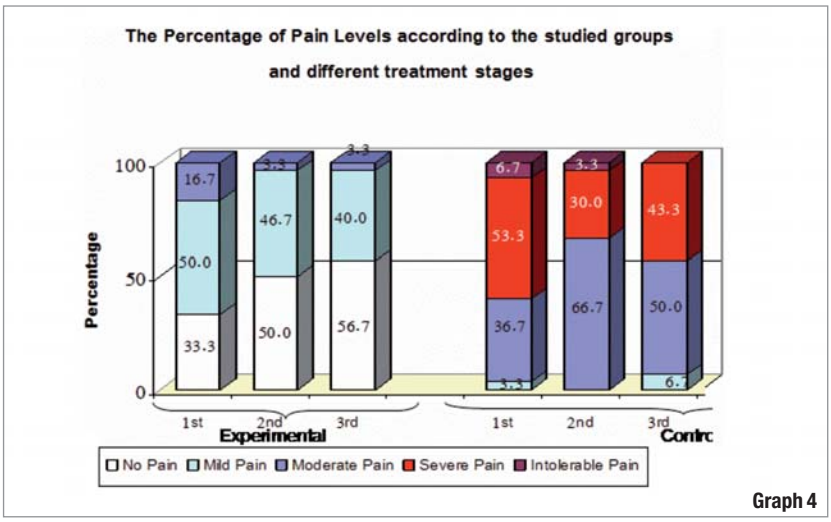
1- X-rays
_A-Upper maxillary CT scan with 3 mm sections thickness.
_B-Antero-Posterior view
_The treatment plan for these patient included Rapid maxillary expansion because of the presence of posterior crossbite or there was not enough space for a complete alignment.



Graph 2



Graph 3



Graph 4

Graphs 2 & 3_Bone density.
Graph. 2: The bone density at the opened suture site was higher in the lased group than control (non-lased) group. Graph. 3: Bone density in the posterior region was higher than the anterior region in both groups. However it was higher in lased than non-lased group.
Graph 4_ Pain Study.
The pain level was higher in the non-lased group throughout the entire treatment.

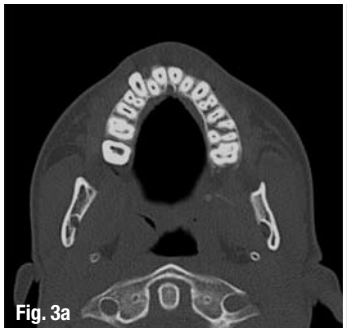


Fig. 3a


Fig. 3b


Fig. 4a


Fig. 4b

Fig. 4a_Before
Fig.4b_After
Fig. 5a_Before
Fig. 5b_After

_The appliance chosen was a Hyrax expander, McNamara type.
_The Hyrax expander was opened twice daily till we reached an overcorrection position (Figs. 1 & 2).
_After one week of achieving the required expansion, Hyrax was removed temporarily to allow taking the CT scan image without artifact effect of the metal (Figs. 3 & 4).

_Laser therapy protocol

a- Selected locations for laser application:
1- Mid palatal Suture (9 J/cm^2).
2- Intermaxillary suture (4 J/cm^2).
3- Zygomaticomaxillary suture (2 J/cm^2) per side.
b- The laser handpiece was held in contact with the tissues and sweeping movements were performed.

_Pain questionnaire

At every visit (after 1mm), every patient was asked about the pain experienced during this period and was recorded and ranked according to the following schedule (Table 1).

In order to study the statistical pain differences, the questionnaire was divided into three phases each phase for a duration of one week.

Degree of Pain	Rank Value
No pain	0
Mild pain	1
Moderate pain	2
Severe pain	3
Intolerable pain	4

Tab. 1

_Results

_Bone density study (Hounsfield unit).
_Pain study.

_Discussion

_Orthodontic tooth movement involves both modeling and remodeling activity that is modulated by systemic factors such as nutrition, metabolic bone diseases, age and drug usage history.
_According to several studies LLLT is an effective tool used to prompt bone repair and modeling post surgery. This is referred to the biostimulation effect of the LLLT.
_This effect had been well studied in the medical field and proven to have an enhancing effect on fibroblast growth.
_Tooth movement and/or orthopedic movement is dependent on a painful and inflammatory adaptation of the alveolar process.
_To relieve such pain, several methods have been used. One of them is to use drugs (NSAIDs). Although these could be effective in relieving pain, they may also reduce the rate of tooth movement.
_The biostimulation effect of the LLLT was also reported to be effective in reducing the pain arising from dental treatment procedures.

_Conclusion

_The (Ga-Al-As) low level laser used in this study is considered to be an effective tool during orthodontic treatment as:

_The rate of bone density raised significantly.
_The pain level reduced significantly.

Editorial note: The literature list can be requested from the editorial office.

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Minimally invasive dentistry (MID) concepts for the caries treatment by Er:YAG laser

Authors_R. Kornblit, U. Romeo, A. Polimeni, Italy

_Introduction

The dental caries lesion is a bacterial infection created by cariogenic bacteria resulting in increased proportions of acid, producing consequently a low pH that produce a demineralization of the tooth structure.[1,2] In the past, carious treatment approach was mainly a surgical removal of the infected tissue and the subsequent tooth reconstruction with a dental restorative material. At that time, diagnosis of caries lesions was carried out at more advanced disease stages than the incipient lesions detected today and instrumentation was limited to slow rotary and hand instruments.

The cavity preparation had an excessive tooth structure reduction even for relatively small lesions, removing not only the caries tissue but also healthy integrate tooth tissue in order to follow the concepts of extension for prevention, resistance and retention.[3,4]

The modern operative dentistry is moving to a minimally invasive approach, in which caries are managed as an infectious disease and the focus is on maximum preservation of tooth structures.[5,6] The introduction of adhesive dental materials made it possible to conserve tooth structure using, minimal invasive preparation, because adhesive materials don't require any incorporation of mechanical retention features. Minimally invasive dentistry (MID) adopts a philosophy that integrates prevention, remineralization and minimal intervention for the placement and replacement of restoration. MID reaches the treatment objective using the least invasive surgical approach with the removal of minimal amount of health tissue.[7]

Nowadays the erbium laser can be the answer to the MID requirements.The wavelength of Er:YAG laser is 2,940 nm that correspond to the absorption peak of water is indicated for hard dental tissue and bone ablation where the main substances are water and hydroxyapatite. Maximum absorption in water results in an effective microexplosion mechanism. The explosive vaporization creates a plume of ablation of the carious tissues. The ablative action is also due to a combination of photothermal and photoacoustic effect caused by the microexplosions of water on the target tissue.


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5

The purpose of this clinical article is to show trough out clinical cases the capacity of an Er:YAG laser (FOTONA—Slovenia) to remove caries tissue, following the concept of MID .

_Clinical cases

Caries with a depth from just in dentine to halfway of the dentine thickness (at least 1 mm away from the pulp chamber) were treated, following the requirements of MID in operative dentistry. The parameters used were: VSP mode (140 s per pulse), Energy from 150 mJ to 200 mJ, frequency from 15 Hz to 20 Hz, fluence from 30 to 40 J/cm^2. Both eyes of patient's and operator's were protected by laser safety eyewear (UNIVET, 705.00.00.00.BL, certificated CE, Dir. 89/686/CEE).

The caries were ablated in focus mode using the Er:YAG laser with the mirror handpiece R2 at a distance between 0.8 to 1 cm from the tooth with slow fluid continuous movements, under water-cooling using tap water and the high speed suction to handling the plume of the carious tissues. The preparation of the cavities was limited to vaporizing of the infected layer leaving the affected one, without any ablation of healthy tooth structure.

The removing of the amorphic dentine was checked with the probe and in some cases we finished to remove the infected layer using a dental excavator (ASA stainless 1700-2).

All the teeth were restored in the same appointment using acid etch Scotchbond Etchant (3M ESPE, Dental Products), adhesive Scotchbond 1 XT (3M ESPE, Dental Products) and composite Z100 MP RESTORATIVE (3M ESPE, Dental Products).

The resin composite was polymerized in a conventional mode with a commercial halogen light 52 W, spectrum 400–515 nm (Polylight 3 Steril, CASTELLINI), curing for 40 seconds each layer of the resin composite (at least two layers for filling) with the light tip at 8 mm distance from the tooth surface.

_Case 1

Thirty years old male with occlusal dental caries (I class of Black) of the lower right second molar (Fig. 1). The treatment was done without anesthetic, using a rubber dam. The non sustained enamel and carious tissues were removed by Er:YAG laser following the modality and the parameters descrived above (Figs. 2 & 3). The cavity was filled with composite resin as descrive above (Fig. 4).

_Case 2

Forty two years old female with mesio-occlusial dental caries (II class of Black) of the upper left first molar (Fig. 5). The treatment was done without anesthetic, using a rubber dam. The non sustained enamel and carious tissues were removed by Er:YAG laser following the modality and the parameters descrived (Figs. 6 & 7). The treatment was completed with a composite restoration (Fig. 8).

_Case 3

Twenty nine years old female with occlusal dental caries (I class of Black) of the lower right first molar (Fig. 9). The treatment was performed under a rubber dam using the Erbium to remove the carious tissue (Fig. 10). During the application was not necessary to use anesthetic. The non sustained enamel and carious tissues were removed by Er:YAG laser following the modality and the parameters descrived in the general part (Figs. 11 & 12). The cavity was filled with composite resin (Fig. 13).

_Discussion and conclusions

The modern operative dentistry can be based on a minimally invasive techniques where caries removal and cavity preparation can be completed with minimal tissue removal. The conservation of hard dental tissue increases the longevity of the restored tooth.[8] The use of Er:YAG laser is efficient, effective, safe and suitable for caries removal and cavity preparation[9,10], generating similar heat increases under water-cool-


Fig. 6

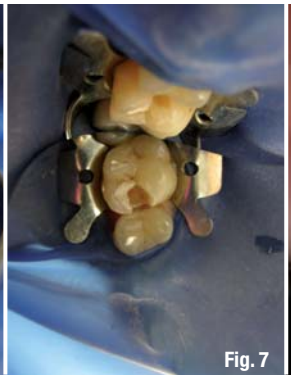
Fig. 7


Fig. 8


Fig. 9


Fig. 10


Fig. 11


Fig. 12


Fig. 13

ing compared to the preparation with high-speed instrument.[11,12]

The aiming beam of Er:YAG laser (incorporated in the system) delimit an ablating spot area of 0.8 mm diameter (in fact the ablating area is even smaller) so that irradiating dental hard tissue with laser in focal mode allows to ablate areas not larger than 0.8 mm in diameter.[13]

Removing only small areas of dental caries can't be done with the conventional burs because even the smallest one, when drilling, takes off more tissue. Additionally the burs are removing tissue tridimensionally comparing to the laser beam that is vaporazing just the irradiated surface. Having the possibility to ablate with Er:YAG laser small areas helps in reaching one of the most important goal of MID that is the maximum preservation of dental tissue. The MID divided the carie lesion in two layers. The infected layer which is heavily bacteria contaminated is composed of soft amorphic dentin (denatured collagen matrix) without any potential ability to remineralize. The underlying layer, the affected one that is less contaminated by bacteria, is partially demineralized with an intact collagen matrix conserving the potential to remineralize. The goal of MID is to eliminate the infected layer of the caries conserving the below affected layer.[14]

The diamond and tungsten carbamide burs are indiscriminant in their removal of carious tissue, usually removing infected and affected dentin simultaneously without the possibility to distinguish between the two zones, sometime even extending into underlying intact dentin. Using the Er:YAG laser beam for caries removal the visual control of the ablating area is better than with the conventional instruments and having the possibility to vaporize such small areas of 0.8 mm diameter, it is possible to vaporize only infected tissue and to stop the moment the affected zone is reached as suggested by MID.

The bactericidal effect of laser system on dentin surface was demonstrated in a several studies. The good disinfection of the contaminated dentin prevents failure of the restoration process (secondary caries).[15,16] Decontaminating the affected layer after removing the soft amorphic dentine can help in preventing possible future pulp complications.

The introduction of resin-based composite restoration in dentistry helped to reach the goals of MID. Conditioning the dentine surface removes the smear layer and opens the dentine tubules, after bur preparation, forming a defined hybrid layer and resin tags of the composite material into the opened tubules. The ablation of dental hard tissue with Er:YAG laser leaves dentin surface without smear layer (unlike after bur preparation) The lack of smear layer allows the formation of hybrid layer and resin tag hybridization into the opened dentin tubules resulting in a better retention of the adhesive composites. Additionally some studies showed an enlargement of dentin tubules.[17]

The irradiated enamel at SEM have the characteristic appearance of a lava flow.[18,19] This appearance is due to the complete opening of the prism core with a partial ablation of the interprismatic structure. The irregular aspect of the peripheral enamel is due to the fragility of the hexagonal form of the prisms that looks "ready to break". The irregularity of the enamel surface after Er:YAG laser irradiation can be compensated with the application of phosphoric acid that attacks and regularize the previously opened prisms; by this way the enamel surface increases the micro-infiltration of the bonding. It is important to remember that using an adhesive system after laser preparation of the tooth, the enamel surface prepared by laser should be follow by acid etching to allow less microleakage at the interface enamel-composite, however, this has no influence regarding bond strength and/or shear bond strength values.[20,21]

The conclusion of this clinical experience is that the Er:YAG laser is a valid option in the removal of dental caries respecting the concepts of minimally invasive dentistry.

Editorial note: The literature list can be requested from the editorial office.

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Diode laser (810 nm) applications in clinical Orthodontics

Authors_Dr Deepak Rai & Dr Gurkeerat Singh, India

CASE 1

Fig. 1_Large midline diastema with thick frenum.

Fig. 2_Orthodontic closure of diastema.

Fig. 3_High labial frenum.

Fig. 4_Diode laser frenectomy.

Fig. 5_Healed site after 7 days.

_Dentistry has changed exponentially, osseointegration, dental bonding & kinetic energy tooth prepration are current clinical buzzwords. The arena of Dental Esthetics has expanded to cover more than just simply restoring compromised teeth, but involves revamping smiles in entirety. Soft tissue harmonization have become paramount to overall development of Dentofacial Esthetics.

Unique versatility and vast potential of dental lasers allows many procedures that enhance overall treatment success. Lasers have become an indispensable clinical tool in Orthodontist's armamentarium.[1] Diode lasers allow safe fast efficient incisions with better field of visibility as there is minimal bleeding, and above that patient perceives a pressure less cut which often requires no suturing.[2] This article will present clinical case reports where diode laser* has been used for benefit of orthodontic patients.

_Case report 1

Frenectomy for midline diastema correction

Labial thick & high attached frenum is commonly regarded as contributing etiology for maintaining midline diastema.[3] It is an accepted contemporary view that midline diastema first should be corrected with Orthodontics and then frenectomy so that scarring that results after conventional scalpel based frenectomy doesn't interfere with tooth movement.[4] With diode laser the proce-


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7

Fig. 8


Fig. 9


Fig. 10


Fig. 11

dure can be done before complete closure or after as healing of laser wound doesn't involve any scarring.[5] The following patient had large diastema (Fig. 1) and was treated with fixed appliances to first close the diastema (Fig. 2) followed by frenectomy (Figs. 3 & 4). The healing was uneventful (Fig. 5).

_Case report 2

Canine exposure in labial sulcus

Labially erupting canines are common malocclusion (Fig. 6).[6,7] Conventional exposure with scalpel based method leads to extensive bleeding (Fig. 7) and the field of operation requires special hydrophilic moisture insensitive primers to bond orthodontic attachments. Use of diode laser 810 nm ensures easy exposure with minimal bleeding and least patient discomfort (Figs. 8, 9 & 10). The clear bloodless field ensures fast predictable bonding (Fig. 11), thus enabling fast correction of malocclusion (Fig. 12).

_Case report 3

Canine exposure on palatal aspect.

Palatally impacted canines[8] are difficult situation requiring surgical raising of an extensive mu-

CASE 2

Fig. 6_Labially erupting 43.
Fig. 7_Conventional scalpel surgery.
Fig. 8_AMD Picasso diode laser* 2.3 W, rep mode.
Fig. 9_Diode laser bloodless incision.
Fig. 10_Exposed 23.
Fig. 11_Orthodontic attachment bonded in dry field.
Fig. 12_23 Orthodontically extruded.

CASE 3

Fig. 13_Palatal 23 exposure.


Fig. 12


Fig. 13

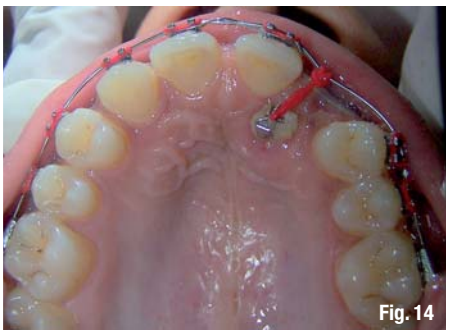
Fig. 14


Fig. 15


Fig. 16


Fig. 17

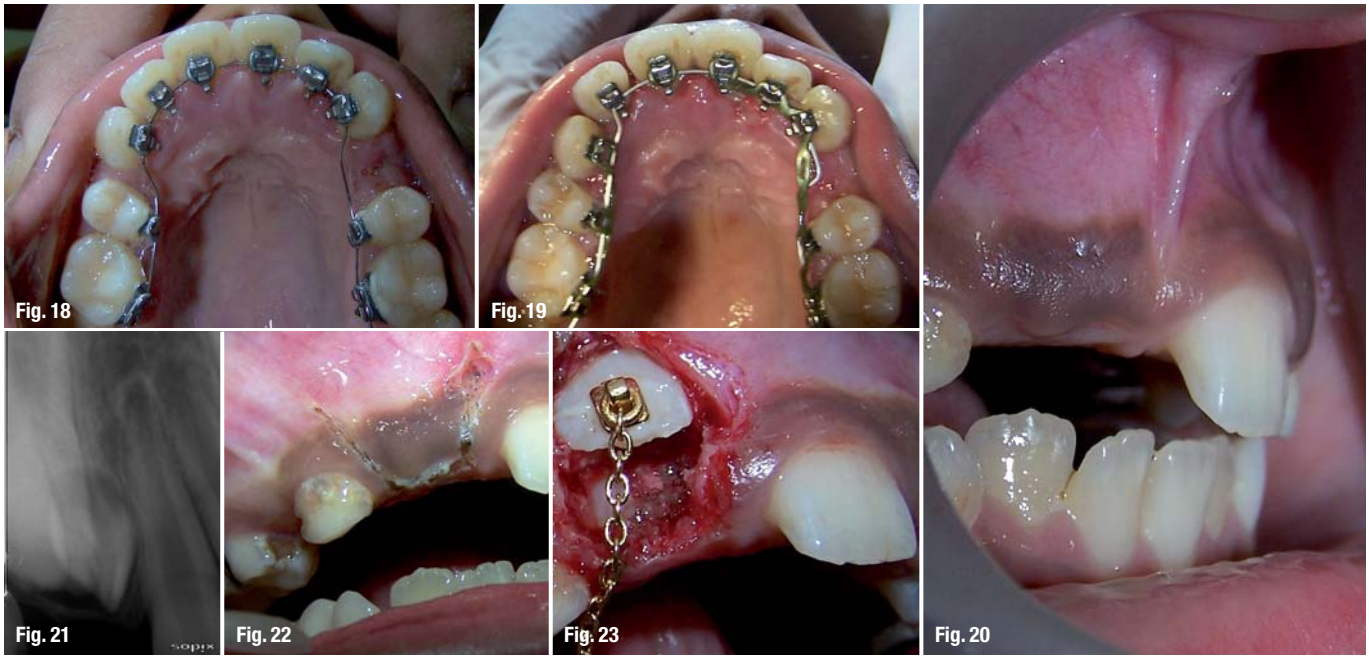

Fig. 14_Orthodontic attachment for alignment.

CASE 4

Fig. 15_Gingival hyperplasia during orthodontic treatment.

Fig. 16_Diode laser assisted gingivoplasty.

Fig. 17_Healed site.

CASE 5

Fig. 18_Palatal gingival hyperplasia with lingual appliance.

coperiosteal flap, with sutures at the end and an extensive postoperative discomfort and swelling.

Diode laser allows exposure without any extensive flap (Fig. 13) and generally no sutures are required after the procedure. Patient experiences minimal pain or discomfort. Bloodless field ensures instant bonding of orthodontic attachment (Fig. 14).

_Case report 4

Gingivoplasty

Orthodontic fixed appliances are generally associated with issues of good oral hygiene maintenance.[9] In many cases we notice gingival hyperplasia (Fig. 15). Such enlargement further impedes good hygiene and is commonly associated with bleeding.[10,11] Diode laser can be used effectively in such situations (Figs. 16 & 17).

_Case report 5

Palatal gingival hyperplasia

Lingual Orthodontic appliances are generally associated with gingival hyperplasia, preventing us from the access to gingival hooks to engage elastomeric attachments (Fig. 18).It is difficult to sculpt gingiva around lingual braces with scalpel due to poor

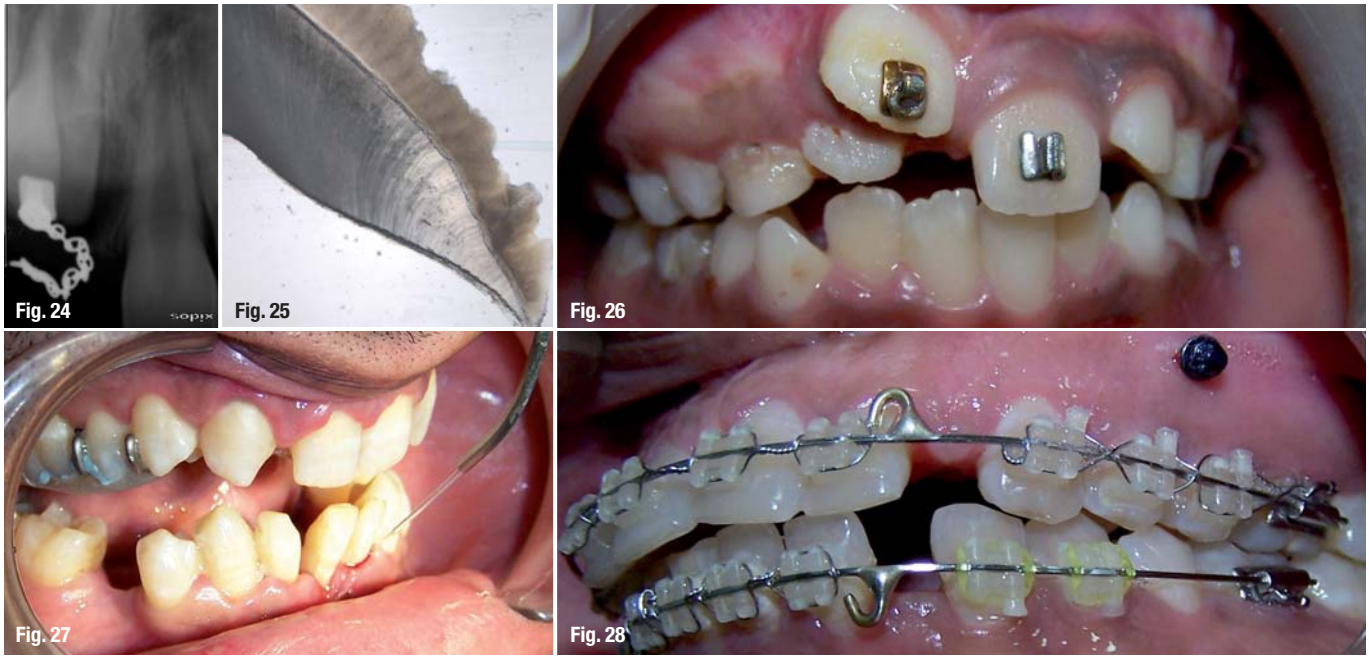


Fig. 29

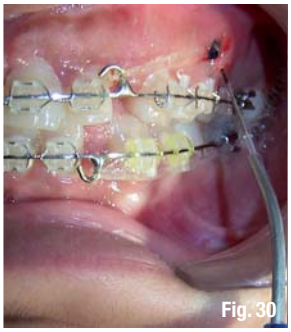
Fig. 30


Fig. 31

access and poor visibility. Even electrocautery would not be indicated due to chance of sparking on contact with metal braces.[12] Diode Laser (2 W Repetitive mode) allowed us to sculpt the hyperplastic gingiva easily without any bleeding or discomfort allowing easy access to engage elastic attachments (Fig. 19).

_Case report 6

Diode laser assisted removal of odontome in maxillary anterior region preventing eruption of permanent incisor

Patient was a 10 year old girl with unerupted central incisor (Fig. 20). Radiovisiographic evaluation suggested mesiodens (Fig. 21). Diode laser was used to give primary incision and simultaneous frenectomy at 2 W repetitive mode, followed by 2.3 W continous mode, ensuring bloodless field of operation (Fig. 22).The tooth like mass was removed (Fig. 23) and orthodontic eruption appliance was bonded (Fig. 24).Histologic examination revealed it to be an odontome (Fig. 25).[13,14] The tooth erupted in few months with orthodontic active guidance (Fig. 26).

_Case report 7

Laser assisted circumferential supracrestal fibrotomy/LACSF/pericision

Control of tooth rotation correction in Orthodontics from relapse is always a challenge. Perma-

Fig. 19_After diode laser gingivoplasty.

CASE 6

Fig. 20_Unerupted incisor with high frenum in 10 year old girl.

Fig. 21_RVG image showing tooth like mass.

Fig. 22_DIODE 810 nm assisted incision.

Fig. 23_Extraction of tooth like mass and orthodontic attachment bonded.

Fig. 24_Post extraction RVG.

Fig. 25_Histological section: compound composite odontome.


Fig. 32


Fig. 33


Fig. 34

Fig. 26_Erupted tooth.

CASE 7

Fig. 27_Laser assisted circumferential supracrestal fibrotomy.

CASE 8

Fig. 28_Orthodontic microimplant for anchorage.

Fig. 29_Inflammation around microimplant.

Fig. 30_Decontamination and biomodulation with laser at low power.

Fig. 31_ Corrected malocclusion with healed site.

CASE 9

Fig. 32_Severe deep bite, class II DIV 2, missing upper 12,22.

Fig. 33_extensive mucogingival destruction.

Fig. 34_After preliminary scaling.

Fig. 35_Laser assisted vestibuloplasty.

Fig. 36_Lingual appliance to consolidate spaces.

Fig. 37_Improved gingival attachments.

nent lingual bonded retention is essential. It is also suggested to do circumferential supracrestal fibrotomy to allow elastic fibres to reorganize favorably without causing relapse of correction.[15,16,17] Conventional scalpel assisted CSF is associated with bleeding and requires infiltration anaesthesia .The authors are trying diode laser at different settings of power & are currently evaluating success of this laser assisted circumferential supracrestal fibrotomy (LACSF) (Fig. 27).

_Case report 8

Diode laser assisted salvaging of orthodontic microimplant

Extensive work is being done on use of lasers in salvaging osseointegrated dental implants.[18] We tried using diode laser for orthodontic microimplant which is used for short term. The patient received two orthodontic microimplants for retraction (Fig. 28), the one on left side was rigid but showed some inflammation of tissue around the implant (Fig. 29). Diode laser was used at 0.5 W to decontaminate and allow healing of tissue around microimplant. The implant survived and served its orthodontic purpose (Figs. 30 & 31).

_Case report 9

Vestibuloplasty in patient with mucogingival problem before undergoing Lingual Orthodontics

The patient had severe deep bite, associated with extensive mucogingival damage, with poor oral hygiene[19] (Figs. 32 & 33). After initial scaling and root planning (Fig. 34), Diode laser was used to perform vestibular extension (Fig. 35). Lingual appliances were bonded and spaces were consolidated with good oral hygiene maintenance (Figs. 36 & 37). Diode laser can also be used as low level therapy during orthodontic tooth movement[20] and especially during situation where heavy orthopedic forces are applied as in rapid maxillary expansion.This is an area where the authors are guiding a postgraduate research project in their department.

The incorporation of lasers in routine orthodontic practice is the order of the day. The practices that embrace this technology will surely flourish and will have satisfaction of providing best dental care to there patients.

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Fig. 35


Fig. 36


Fig. 37

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Use of the Er,Cr:YSGG and Er:YAG lasers in restorative dentistry

Authors_Prof Dr Giuseppe Iaria, Rolando Crippa, Giovanni Olivi, Matteo Iaria, Stefano Benedicenti, Italy

_The Er,Cr:YSGG laser has an active medium of yttrium-scandium-gallium-garnet doped with erbium and chromium ions and emits free-running pulsed laser energy at a wavelength of 2,780 nm. the Er:YAG laser has an active medium of yttrium-aluminium-garnet doped with erbium ions and emits free-running pulsed laser energy at a wavelength of 2,940 nm. These wavelengths have a high absorption in water, which makes their application appropriate when ablating oral soft tissue or dental hard tissue. This article examines the principles of use for the Er:YAG and Er,Cr:YSGG lasers in clinical restorative dentistry and reviews the literature regarding different aspects of the use of laser energy on hard tissues.

_Introduction

In 1989, Keller and Hibst illustrated the potential of the Er:YAG laser (2.94 µm wavelength) for the effective ablation of dental hard tissues.[1] As a result there was new development and marketing of free-running, mid-infra-red wavelength lasers during the 1990's. These advantages permitted to address laser wavelengths that were complementary to target tissue elements, allowing clinically-significant ablation rates that did not cause pulpal or collateral thermal injury using proper energy levels. The erbium chromium YSGG (2,780 nm) and the erbium YAG (2,940 nm) laser wavelengths are well absorbed by water and hydroxyapatite contained at different component rates in hard tissue and appeared to offer safe use in cavity preparation.[2–4] The vaporization of interstitial water provided by the Er,Cr:YSGG and Er:YAG lasers results in an explosive dislocation of target hard tissue. These laser wavelengths offer several advantages for restorative dentistry, including precision, selective ablation of target hard tissue and carious lesions, less conductive thermal stimulation of the pulp, reduced collateral damage that might result from rotary instrumentation (such as tactile and thermal damage), and so forth.

This article examines the principles for using the Er,Cr:YSGG and Er:YAG lasers in clinical restorative


Fig. 1


Fig. 2


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7

dentistry and reviews the literature concerning different aspects of laser energy on hard tissues.

_Basic considerations

Using a laser requires delivering light energy of sufficient value to effect tissue change without causing unwanted collateral thermal damage by conducting excess heat into the surrounding tissues.[5] To do this it is essential to establish a rate of interaction that is commensurate with a time frame that allows such interaction to be clinically acceptable in terms of total time required for each procedure.

The rate and the speed of dental hard tissue ablation depends on the appropriate laser energy, in addition to the wavelength, pulse duration, pulse shape, repetition rate, power density, thermal relaxation time of the tissue, and delivery mode.[6-8]

The speed of ablation is also affected by the fluoridation of the tissue, the presence of ablation products and the incident angle of the delivery tip relative to the tooth: placing the delivery tip parallel to the axis of the enamel prisms, in order to access the interprismatic, higher-water content structure maximises the speed of ablation. Ablation is more efficient and heat transfer is minimized when the pulse width is reduced and peak power values rise.[9-11] In addition the use of sharp curettes to remove gross caries can reduce laser use to an acceptable timeframe. The depth of laser ablation depends on the parameters utilized, principally on the energy used per pulse and the number of pulses delivered. To avoid and prevent cracks or structural modifications, the tip (where present) must not touch the surface, nor should excessive energy be applied. When relatively high fluences are involved, it is possible that the laser light is absorbed by the mineral, which results in ablation and/or disruption of the mineral with some structural modification.[12-14] Many conflicting factors interfere with the recommended power value for laser-assisted ablation of dental hard tissue .The ablation threshold of human enamel has been reported to be in the range of 12–20 Joules/cm^2 and for dentin, 8–14 Joules/cm^2 for the Er:YAG and Er,Cr:YSGG laser wavelengths. For an average laser delivery spot-size, using a free-running pulsed emission mode, this may equate to approximately 150–250 mJ/pulse.

It is recommended that the clinician follow manufacturer's guidelines in establishing laser treatment protocols for a given laser, keeping in mind the differing operating parameters of air/water/spot size and any power losses that may occur within differing delivery systems.

_Use of co-axial water spray

The use of water spray with mid-infrared lasers allows working on hard tissues with thermal increases of less than 5 °C: it is essential to prevent debris from accumulating at the bottom of the cavity, which can lead to conductive heat damage.[15-16]

The effects of excessive incident power, the build-up of ablation products, which cause thermal damage to the target and surrounding tissue and the removal of such products by means of a co-axial water spray have been discussed in the literature.[17-21] The affinity of mid-infrared laser wavelengths with water contained in the tissue allows for selective ablation,

in which greater absorption takes place in demineralised tissue, which is richer in organic material and has a higher percentage of water. This absorption offers some protection to the sound underlying tissue while reducing penetration from the beam. To prevent build-up, ablation products should be removed by means of a co-axial water spray. If water spray is not used, laser light is then absorbed by the mineral and the hydroxyapatite crystal themselves may be heated above their melting point.

In consequence, either some disruption of the crystal structure occurs with subsequent resolidification in a different form, or direct ablation of the mineral occurs, but there also is conductive heat transfer to interstitial free water. Relatively high fluences are needed at these wavelengths for this transfer of heat to occur. A micro-cavitated surface that may enhance retention of composite resin can be achieved by using Er,Cr:YSGG or Er:YAG lasers to irradiate enamel and dentin but water spray must be utilized. Conversely, the absence of water spray can lead to cracks in enamel or melted dentin, resulting in unsubstained enamel prisms and flat adhesion dentin surfaces with closed tubules. The negative effects could lead to marginal leakage and non-adhesion of the composite material.

_Exceptions to using water spray

There are two clinical situations which can be treated with lasers without the simultaneous use of a co-axial water spray: the desensitizing technique and the pulp capping. The desensitizing technique must be done without water and without the laser tip making direct contact with the tooth. In addition the laser should be used for a short time only and with low power (few pps, very long releasing time, few mJ). For the pulp capping the technique must be carried out without water but with air cooling and the tip must touch the surface for only a few seconds.

_Cavity margin considerations

A succession of studies has identified the fragility of laser-irradiated enamel, relative to the stability of the post-restoration margins. Studies have proposed a combined approach of combined laser-irradiation, acid-etch techniques, to overcome such potential problems. It may be necessary to remove grossly overhanging and unsupported enamel with a rotary bur, scalpels or an ultrasonic device either to expedite cavity preparation or provide a stable post-restoration margin.[22-27]

_Acid-etch considerations

Er:YAG laser irradiation produces a surface visually similar to an acid-etch pattern but without a smear layer. While the surface produced by the Er:YAG laser is similar to the conventionally prepared, etched enamel surface, it still requires acid etching to obtain an equivalent bond strength. The use of acid etching for enamel and dentin surface modification is must be carried out each time before bonding application. Laser irradiation of enamel is not a valid alternative to acid-etching pretreatment for resin composite materials adhesion. As a result, Er,Cr:YSGG and Er,YAG irradiation alone cannot be recommended as a viable alternative to acid etching.[28,29]

_Avoidance of dehydration

Before bonding application the dentin surface must not be dehydrated: the use of lasers without water—mist before composite restorations is no longer recommended. Laser ablation does not produce a smear layer, which would impede adhesion to laser-irradiated surfaces. Nevertheless, a selective ablation of organic tissue occurs when these lasers are uses; as a result, there is less collagen left to be exposed or hybridised after laser conditioning of dentin, indicating that acid-etching and water spray after laser treatment is advisable.[30,31]

_Choice of composite restorative materials

The choice of composite materials must be made on the basis of the depth and width of dentin craters. The laser irradiation of enamel and dentin by Er,Cr:YSGG or Er:YAG lasers results in a "super-rough", micro-cavitated surface that may predispose to ideal retention of composite resin but it is necessary to remember this difference from laser to bur in the choice of materials. The


Fig. 8


Fig. 9


Fig. 10


Fig. 11


Fig. 12


Fig. 13


Fig. 14


Fig. 15


Fig. 16

use of composite nano or micro-filled is fundamental to properly restore laser ablated cavities. Whenever possible, it is advisable to first use a layer of flowable composite. The seal at enamel margins in Er,Cr:YSGG and Er:YAG lased cavities depends on the resin composite formulation of the corresponding adhesive.[32,33]

_Isolation and safety considerations

A rubber dam isolation technique must be used in every procedure to maintain decontamination provided by the laser. Safety measures should include the use of specific protection glasses for the doctor, the assistant and patient, the use of appropriate face-masks to avoid plume aspiration, high-speed aspiration of plume and debris. In addition the dentist must use non-reflecting instruments. Magnification is recommended to allow the dentist better control of his or her work.

_Summary

The Er,Cr:YSGG laser has an active medium of yttrium-scandium-gallium-garnet doped with erbium and chromium ions and emits free-running pulsed laser energy at a wavelength of 2,780 nm. The Er:YAG laser has an active medium of yttrium-aluminium-garnet doped with erbium ions and emits free-running pulsed laser energy at a wavelength of 2,940 nm. These wavelengths have a high absorption in water, which makes their application appropriate when ablating oral soft tissue as well as dental hard tissue. Advantages of using these laser wavelengths in restorative dentistry include precision, selective ablation of target hard tissue and carious lesions, reduced collateral damage that might be caused by rotary instrumentation (tactile and thermal damage), less conductive thermal stimulation of the pulp, no vibrations, and so forth. However, it is essential to apply knowledge and accepted laser settings and modes of application and also to follow the clinical aspects and rules to obtain the best results. Using these lasers and co-axial water spray simultaneously is always advisable, with the two clinical exceptions of the desensitising technique and pulp capping. Other main points to consider are the cavity margins that need to be finished, the use of acid after laser treatment that permits the best adhesion, and the choice of composite materials, which must be based on the surfaces produced by the laser treatment. Specific safety is necessary when using these devices._

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Editorial note: The whole literature list can be requested from the author.

_contact laser

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The use of lasers in periodontal treatment

Author_Howard Golan, USA


Fig. 1

_There are some dentists that embrace technology. Technology can improve the delivery of dentistry and also help traditional dental philosophies evolve. For example, a patient presents with an emergency; a broken cusp on an upper bicuspid, bellow the free gingival margin. Technology, lasers and CAD/CAM specifically, allows the clinician to provide endodontics, osseous crown lengthening, an adhesive core build up and a definitive porcelain restoration all in a single appointment.

The advantages to this type of treatment are obvious. However, the dentist must be willing to alter his/her current dental philosophy and many times make an initial financial investment that is larger than what the clinician is used to. The traditional way to provide treatment such as endodontics in 1–2 visits, a post and core, an elastomeric impression, provisional restoration, referral to a specialist, surgical healing time and then definitive cementation of the restoration currently is a valid and overwhelmingly used treatment sequence. Sometimes, however, newer technology can perform these tasks just as well if not better then traditional methods all the while improving the dental experience for the patient. Lasers have been used in dentistry for the removal of soft tissue for more than two decades. Carbon dioxide, Nd:YAG, and Diode lasers have been very predictable and successful for the removal of oral soft tissue. In the last decade, the erbium lasers have been used for soft tissue and for restorative, endodontic, and surgical procedures. Erbium lasers are efficient in removing enamel, dentin and bone. However, the last five years have seen a tremendous push by the laser manufacturers for the lowest cost and most portable diode lasers. Due to their more approachable price point, and an increasing number of U.S. jurisdictions allowing hygienists to use these tools, the diode lasers have had sort of a renaissance.


Fig. 2a

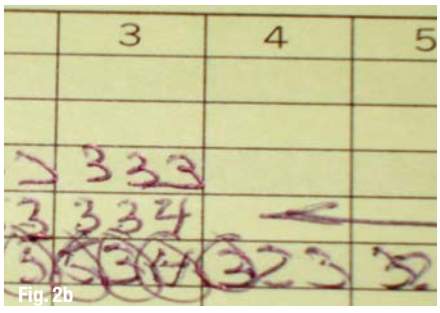

Fig. 2b

One of the most impacted areas of laser use in a general practice has been in the area of periodontal treatment. The treatment of periodontal disease is often a difficult arena for the general dentist to enter. As a chronic disease that so often relies on the host response for success, true treatment success is often never seen. Often times the general dentist chooses not to treat periodontal disease, referring patients to a specialist. As will be shown in subsequent paragraphs, this modality many times results in the patients never getting treated at all. Lasers have allowed me to treat many different periodontal cases. It has introduced patients to periodontal treatment in a minimally invasive way ensuring that almost all patients diagnosed with periodontal disease get treatment. Lasers have allowed me to increase the services that I provide in my practice by adding periodontal procedures that would have not been done before the integration of laser technology. Finally, introducing more and more patients to periodontal treatment has increased my referrals to periodontal specialists.

_The controversy: Science vs. Clinical results

I have always been an advocate of evidenced based dentistry. I rely on the results of science more than ever before. From endodontics to adhesive dentistry scientific evidence is important in formulating my treatment decisions and protocols. Periodontal disease has and continues to be researched heavily. Each year the systemic impact of periodontal disease is being uncovered and understood each day. The periodontal community aims to base its treatment decisions on the science. However, there is no absolute cure for periodontal disease. It is a complicated often chronic multi-factorial disease process. Bacteria are just one factor. However, one must also look at patient compliance, environmental factors including the patient's restorative history, and systemic issues. Thus, it is essential that clinicians in evaluating and treatment planning a patient for periodontal disease look at a wide spectrum of factors, many of which might conflict with the scientific literature. Lasers have been controversial because of the claims of the manufacturers that are not solidly backed up by science. There is no question that the lack of multi-center, double blind, and randomized trials inhibits the ability of lasers to gain widespread acceptance in the periodontal community. However, many times each and every day practitioners, general and specialists alike, practice dentistry based on anecdotal evidence. Relying on their own successes and failures to treat their patients. If we as clinicians only practice what and how science tells us to practice then we are many times doing a disservice to the patient. Dentistry is both a science and an art and the individual judgment of the clinician is often as important as a published research article. Thus, we can use lasers and the science that it available. As just one battalion in a large army against the fight against periodontal disease. Lasers provide advantages that traditional therapies do not. When used properly, laser therapy is a big weapon in this fight.

_What do lasers have to offer?

Lasers (Light Amplification by Stimulated Emission of Radiation) use light energy to have a clinical effect of oral tissue. This light energy can be converted to heat and that heat is used to remove tissue and destroy bacteria. However heat can have negative effects on tissue. Hard tissue burning or melting and possible soft tissue necrosis must be avoided or at least minimized. Other lasers use the potential energy of light and convert it to kinetic energy with another substance (e.g. water) to remove or ablate tissue. This allows the effective and efficient removal of infected epithelium and granulation tissue without the necrotic effects of heat. This provides less post-operative issues such as swelling and pain. Lasers are also effective in removing hard tissue including bone and calculus. In fact the U.S. Food and Drug Administration has approved a laser for calculus removal. Furthermore, because of the ability to collimate and bend light, lasers can access areas such as furcation and root anatomy that even surgical access with curettes and ultrasonics could not. Thus many procedures that were once absolute surgical cases can be treated non-surgically. The treatment of periodontal disease requires the proliferation of some cells while excluding other cells. To get re-attachment and regeneration, epithelial cells need to stay away from the healing site while fibroblasts and odontoblasts should be encouraged to enter. Lasers have the ability to assist in both areas.


Fig. 3

For exclusion, lasers can de-epithelialize the area, by removing the epithelium to the connective tissue, both on the internal pocket wall and the external pocket wall. The fast growing epithelium is retarded to allow the slower moving fibroblasts and os-


Fig. 4a


Fig. 4b

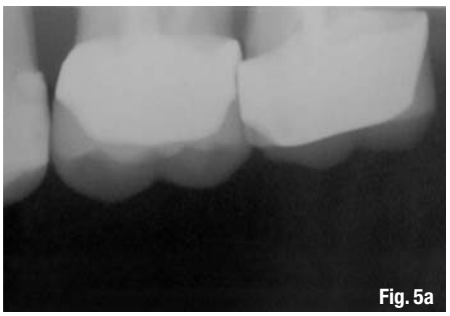
Fig. 5a

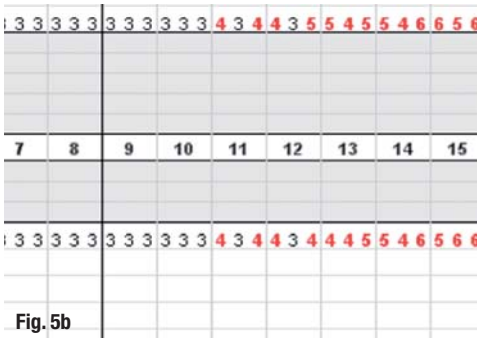

Fig. 5b

teoblasts to do their work. For proliferation and migration, lasers when introduced to the oral tissue at power levels too low to cut, have actually been shown to increase the proliferation and migration of the osteoblasts and fibroblasts. This is called photobiomoduation or low-level laser therapy (LLLT). The use of LLLT is ever expanding in medicine and dentistry. In dentistry, LLLT is used for pain relief, such as TMD and wound healing and to control inflammation, which is essential for the successful treatment of periodontal disease. Finally, the LLLT allows patients to heal from laser procedures faster and with fewer incidents by supporting the wound healing response and suppressing the inflammatory response.

_Laser assisted periodontal therapy: Clinical situations

Treat General/Refer Specific

One of the biggest challenges in a general practice is getting patients to actually go to a periodontist once referred. Patients are consistently referred but many times but never follow through. If their condition goes untreated it affects their health, their mouth and does not allow me to go forward with other treatment such as prosthetics. Patients are more likely to follow through with treatment when it can be all accomplished within the general office. Often periodontal disease is not acutely painful and thus patients will prolong the treatment until there is an acute problem. A less expressed but as significant of a reason for patient's not to the specialist is fear. Periodontal surgery does not have a great reputation. Irrespective of the ability of the clinician. Patients hear stories of pain, swelling, bleeding and sensitivity. The last thing clinician's want are patients not going having treatment because of fear. However, when sent to specialists for specific procedures on a finite number of periodontal sites, the patient is more likely to seek treatment. Specifically, we have seen that a patient that is referred for the treatment of tooth #14 (maxillary left first molar) does not hesitate to go for treatment compared to a patient that is sent to that very same referral for the upper left quadrant.

Therefore, our philosophy is to treat as much of the disease process in the general practice non-surgically, then upon re-evaluation send only the non-responsive areas to the periodontal specialist for surgical intervention. Introducing a laser into the non-surgical equation provides the patient with a minimally invasive non-surgical option. The laser provides something different, something new that most patients are not familiar with. Scaling therefore is not the primary therapy but an adjunct to laser therapy. Thus, the patient realizes that surgery will only be done after all non-surgical options are exhausted and that those treatments will not be painful and there is no reason to fear "gum" treatment. When surgical intervention is recommended, the patient understands the efforts made and that surgery must be accomplished in a localized area, minimizing the potential uncomfortable post-operative consequences. With this philosophy, we have seen a threefold increase in the number of patients referred to the periodontist that actually have the treatment completed within a reasonable time of referral. This is compared to referrals before lasers were introduced into the practice.

Site Specific Treatment –he recall patient

When a minimally invasive procedure is available to patients, it takes much less effort to educate a patient and get the patient to accept treatment. When a laser is placed inside the hygiene treatment room, a recall patient with an isolated periodontal pocket can be treated at the time of recall. In many jurisdictions in the United States, hygienists can use lasers for periodontal treatment. This allows the dentist to diagnose the condition on examination, instruct the hygienist what to do and leave the room and return to treating his own patients. Thus, a patient can not only have their cleaning and checkup but also take care of a dental issue without having to return until the next recall. Even in those States that do not allow a hygienist to use a laser (such as the author's) the laser in the hygiene room still allows for this but the dentist does the treatment with the laser. Moreover, site-specific treatment adds a new dimension to the treatment spectrum. Instead of just a scaling and root planing procedure, the dentist can perform, and thus bill a profitable and more definitive treatment with a laser. Figs. 1 & 2 illustrate a patient on a recall visit that exhibited a 5 mm pocket on the mesial of maxillary left first molar. Laser assisted site specific treatment was performed in the hygiene room with a Er, Cr:YSGG laser (Waterlase MD, Biolase Technology, Irvine, CA) and a 940 diode laser (EZlase, Biolase Technology). The perio charting shows initial and 3 and 6 mos recall probing depths.

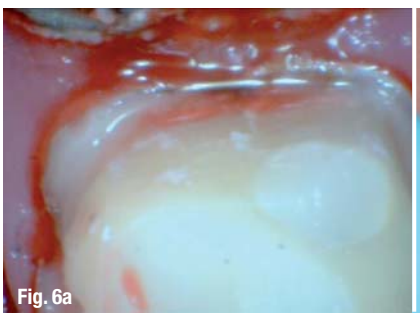
Fig. 6a

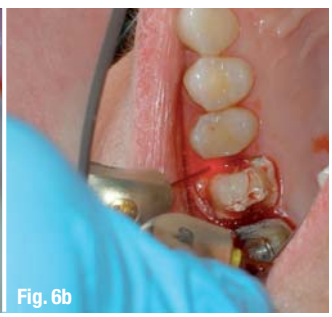
Fig. 6b


Fig. 7

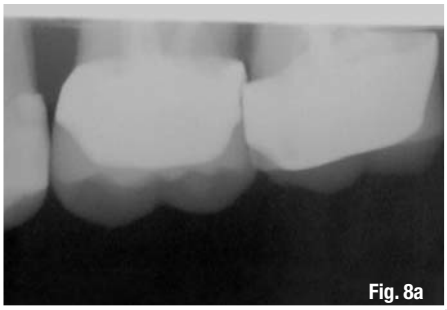
Fig. 8a

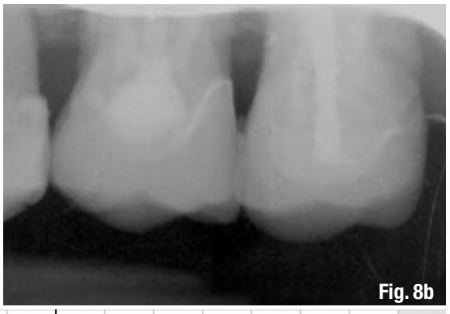
Fig. 8b

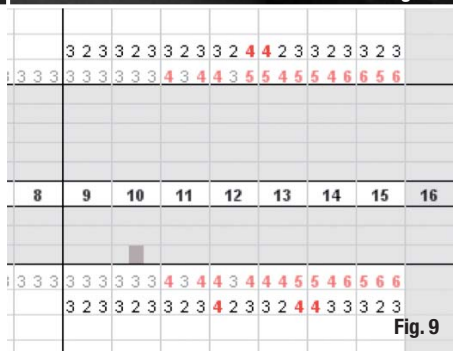

Fig. 9

Management of the hopeless periodontal patient

Many times a patient presents to the office with the following history: Patient has a history of periodontal disease with significant bone loss and periodontal pocketing. The patient had four quadrants of periodontal surgery to treat this condition many years ago. Upon examination, the periodontal pocketing is still present or has returned and the clinician recommends periodontal surgery again. However, the patient tells you that he/she will "never go through that again." The patient had a bad experience with surgical intervention will not entertain the idea of referral to a periodontist. Thus, the past never has the treatment recommended. Furthermore, there are patients where through everyone's best efforts the treatment is never successful. These patients are referred to as "refractory" cases. These patients are particularly difficult since they have spent much money and time and do not see results. Many times they need significant extractions and implants, but at the present time refuse this treatment due to financial or emotional obstacles. Every dental practice has these patients. Laser therapy provides an opportunity to manage, stabilize or treat these patients at reasonable cost and minimal intervention compared to surgical therapy or extractions. Refractory cases will not be "cured" with laser therapy but if we can stabilize the disease process then we provide an invaluable service to the patient. Laser treatment might occur every recall visit or with increased frequency depending on the extent of the disease process. Often we can maintain a patient with his or her own teeth longer than originally thought. This is an area of laser dentistry that was unexpected but has become one of the most rewarding. The figures bellow illustrates a typical hopeless case. Patient is 48 with a long history of periodontal treatment including numerous SC/RP visits and surgery. Patient's hopeless maxillary anterior was restored with implants. The lower arch was treated with laser therapy and scaling. Though there is no evidence of regeneration, the change in the marginal bone is evident three years later. This patient is now five years post treatment with stable periodontal tissues (Figs. 3 & 4). Patient is compliant with 3 mos recall.

Prosthetic replacement: Marriage of technologies

Patients with crown and bridge often present with periodontal pocketing and inflammation. Often, the prosthetics either invades biologic width or the crowns are under-contoured bellow the gingival margin. Treatment of this situation would include replacement of the crowns and treatment of the soft tissue. If there is biologic width invasion then a crown lengthening procedure is needed to adjust the height of the alveolar bone. This condition is often caused by the fundamental need of mechanical retention of the crowns. Due to caries, fracture and short clinical crown heights, the crown preparation needs to be placed significantly under the free gingival margin in order for the crown to stay on. Technological advances in ceramics and adhesion allow for posterior restorations to be adhesively bonded to the tooth allowing for equi- and supra-gingival restorations. These restorations coupled with laser therapy can resolve a periodontal pocket within weeks without surgery and more trauma to the root surfaces. If biological with correction is needed, then the use of a laser to incise the attachment and remove the bone can often be accomplished without flap reflection. This minimizes post-operative pain, swelling and leads to more patient acceptance and profitable treatment for the dental practice. Figs. 4–9 illustrate pocketing and inflammation associated with crowns on the maxillary left first and second molars. The crowns were removed and laser assisted periodontal debridement and curettage was performed. Fig. 7 shows 14 day healing prior to cementation. Fig. 8 are the adhesively bonded ceramic crowns (eMAX, Ivoclar Vivadent, Amherst, NY). Fig. 9 shows the initial and 3 mos recall periodontal charting.

This article is designed to introduce the dental community to lasers and their use in periodontal treatment in a general dental practice. The use of lasers does not eliminate the need for surgery, and especially the wonderful work of periodontal specialists. However, when a philosophy of minimally invasive treatment is employed, then patient and dentist work together to help the patient accomplish their periodontal treatment goals. There will be an increase in periodontal treatment plan acceptance and an increase in periodontal referrals that actually result in treatment._

Editorial note: The literature list can be requested from the editorial office.

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Photosensitizers in dentistry

Authors_Dr D. Koteeswaran, Dr C. Pravda and Dr Ekta Ingle, India

_Photodynamic therapy (PDT), also known as photoradiation therapy, phototherapy, or photochemotherapy, involves the use of a photoactive dye (photosensitizer) that is activated by exposure to light of a specific wavelength in the presence of oxygen (Konopka et al.). The transfer of energy from the activated photosensitizer to available oxygen results in the formation of toxic oxygen species, such as singlet oxygen and free radicals. These very reactive chemical species can damage proteins, lipids, nucleic acids, and other cellular components. Depending on the type of agent, photosensitizers may be injected intravenously, ingested orally, or applied topically.

Although a number of different photosensitizing compounds such as methylene blue, rose bengal, and acridine are known to be efficient singlet oxygen generators (and therefore potential photodynamic therapy agents), a large number of photosensitizers are cyclic tetrapyrroles or structural derivatives of this chromophore; in particular porphyrin, chlorin, bacteriochlorin, expanded porphyrin, and phthalocyanine (PC's) derivatives.

This is possibly because cyclic tetrapyrrolic derivatives have an inherent similarity to the naturally occurring porphyrins present in living matter consequently they have little or no toxicity in the absence of light (Leanne et al.).

Photosensitizers can be categorized by their chemical structures and origins. In general, they can be divided into three broad families:

_Porphyrin-based photosensitizer (e.g., Photofrin, ALA/PpIX, BPD-MA),
_Chlorophyllbased photosensitizer (e.g., chlorins, purpurins, bacteriochlorins), and
_Dye (e.g., phthalocyanine, naphthalocyanine) (Zheng Huan et al.).
_Photosensitizer families (Allison et al.)

_Porphyrin platform
_HpD (hematoporphyrin derivative)
_HpD-based
_BPD (benzoporphyrin derivative)
_ALA (5-aminolevulinic acid)
_Texaphyrins

_Chlorophyll platform
_Chlorins
_Purpurins
_Bacteriochlorins

_Dyes
_Phtalocyanine
_Naphthalocyanine.

_Generations of photosensitizers

Most of the currently approved clinical photosensitizers belong to the porphyrin family. Traditionally, the porphyrins and those photosensitizers developed in the 1970s and early 1980s are called first generation photosensitizers (e.g., Photofrin). Photofrin® (di-

hematoporphyrin ether), available for 30 years in its commercial form, and hematoporphyrin derivatives (HPDs) are referred to as first-generation sensitizers. Photofrin® is the most extensively studied and clinically used photosensitizer.

Porphyrin derivatives or synthetics made since the late 1980s are called second generation photosensitizer (e.g., ALA). Second-generation photosensitizers include 5-aminolevulinic acid (ALA), benzoporphyrin derivative (BPD), lutetium texaphyrin, temoporfin (mTHPC), tinethyletiopurpurin (SnET2), and talaporfin sodium (LS11). Foscan® (mTHPC), the most potent second-generation photosensitizer, has been reported to be 100 times more active than Photofrin® in animal studies. These photosensitizers have a greater capability to generate singlet oxygen; however, they can cause significant pain during therapy, and, because of their high activity, even dim light (60 Watt bulb) can lead to severe skin photosensitivity (Dougherty et al.).

The third agent, ALA, is an intrinsic photosensitizer that is converted in situ to a photosensitizer, protoporphyrin IX. Topical ALA and its esters have been used to treat pre-cancer conditions, and basal and squamous cell carcinoma of the skin.

Third generation photosensitizers generally refer to the modifications such as biologic conjugates (e.g., antibody conjugate, liposome conjugate) and built-in photo quenching or bleaching capability. Third-generation photosensitizers include currently available drugs that are modified by targeting with monoclonal antibodies. These terms are still being used although not accepted unanimously and dividing photosensitizing drugs into such generations may be very confusing. In lot of cases, the claim that newer generation drugs are better than older ones is unjustified. The premature conclusions on novel or investigational photosensitizers may send a misleading message to researchers or clinicians by suggesting that the older drugs should be replaced by the newer ones or wrongly imply to patients that newer photosensitizing drugs are superior to older ones.

Currently, only four photosensitizers are commercially available: Photofrin, ALA, Visudyne™ (BPD; Verteporfin), and Foscan. The first three have been approved by the FDA, while all four are in use in Europe.

_Indications for photosensitizers

_ALA-based PDT for the treatment of oral pre-malignant lesions
_as an adjunctive in treatment of chronic periodontitis and periimplantitis
_for disinfection of root canals in endodontic therapy
_treatment of early head and neck carcinomas
_palliative treatment for refractory head and neck cancer
_as an intra-operative adjuvant therapy, for recurrent head and neck cancer.

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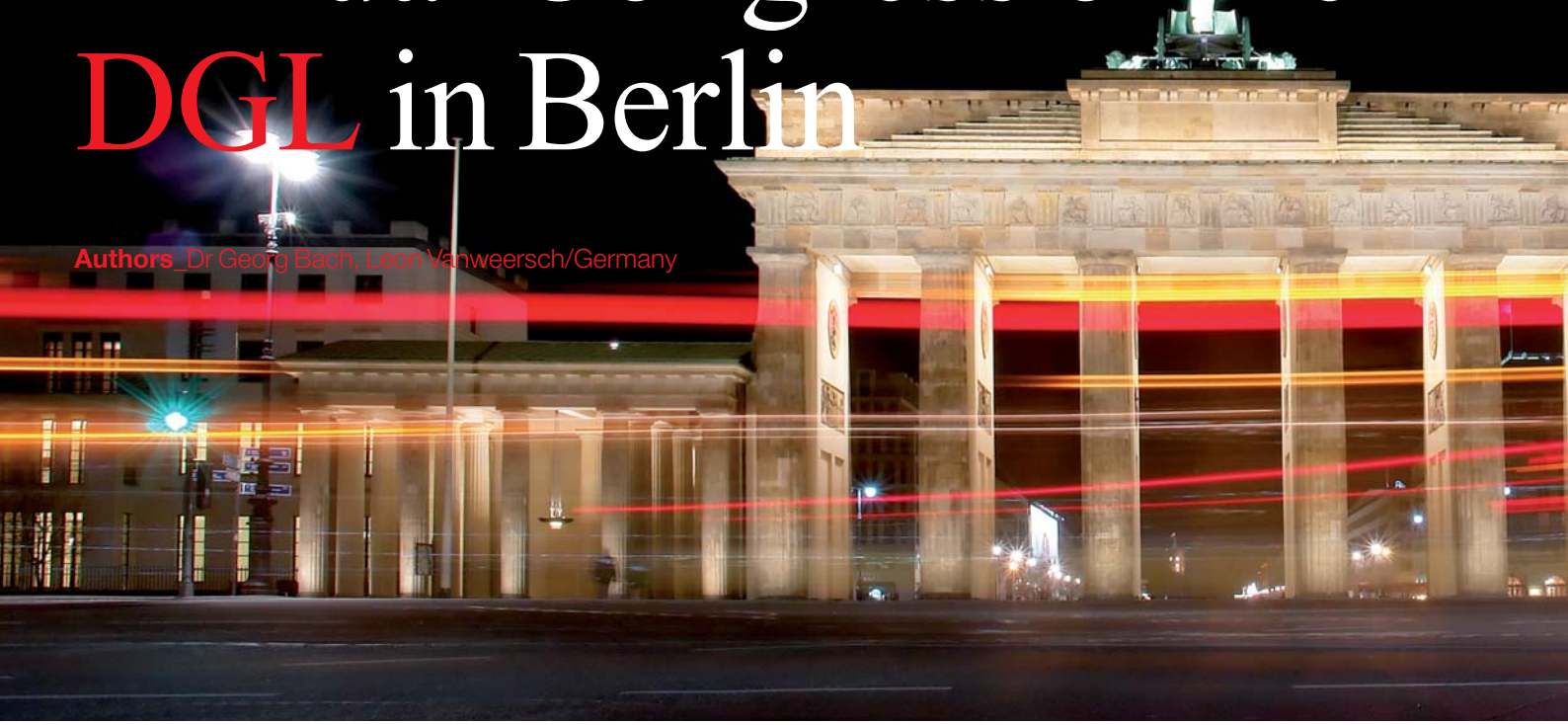
A very successful 20th Annual Congress of the DGL in Berlin

Authors_Dr Georg Bach, Leon Vanweersch/Germany



_More than 250 participants visited the yearly congress of the DGL, which was held together with the 14th LASER START UP, a symposium specially organized for new comers in the world of laser dentistry. Many dentists praised again this very nice concept of sharing two congresses in laser dentistry at one location, which was this year the Palace Hotel in the heart of Berlin.

20 years DGL was the jubilee topic of this congress. Prof Dr Norbert Gutknecht, president of the DGL, reviewed with happiness the past 20 years of this scientific society, which is fully associated with the German Association of Dentistry—the main scientific dental society in Germany. Prof Gutknecht stated that the DGL in particular and laser dentistry in total are now definitive accepted in general dentistry. He mentioned further that in the future dental laser research should focus on the integration of laser light with other high-tech therapy methods like CAD/CAM. Gutknecht's stated his credo: Laser therapy is a profit for dentistry in general.

Gutknecht welcomed in his presidential opening speech many invited national and international guests. Among these guests were Prof Joseph Arnabat (President of the Spanish Dental Laser Society and Organizing Chairman of the WFLD World Congress 2012 in Barcelona), Prof Umberto Romeo (Organizing Chairman of the European Division WFLD Laser Congress 2011 in Rome), Prof Carmen Todea (President of the Romanian Dental Laser Society) as well as Prof Carlos de Paula Eduardo (a long-time Friend of the DGL and Division President of the South-American WFLD Division), and last but not least the Honorary President of the DGL, Prof Friedrich Lampert (University Aachen). The DGL President shared not only his vision concerning the past but also concerning the future in his lecture about the future of laser dentistry. Gutknecht stated that there is still a long way to go, and new techniques but also new wavelengths will improve the spectrum of indications in laser dentistry and simplify many dental procedures in daily dental therapy.

Many other well-known lecturers gave their statements of laser dentistry during the two days congress and here we can only mention some of them. Dr Georg Bach (Freiburg/Breisgau) declared the curious situation that on the one side we have very valid and excellent scientific results, on the other side the acceptance within the universities and other scientific societies is still very conservative and critical. Dr Bach observed also an improving number of laser dentists but by far not so fast as it could be. Bach sees the solution in a systematic development of education in laser dentistry and a better cooperation between the DGL and the different other dental societies in Germany.

Interesting were the results from three different lecturers in the field of laser supported endodontics. Dr Michael Hopp (Berlin), Prof Carmen Todea (Timisoara) and Dr Iris Brader, MSc (AALZ, University Aachen) were unanimous in their statement that the Nd:YAG laser offers the best wavelength for bacterial reductions in the root canal. Especially Dr Iris Brader showed with a success rate of 91% successfully treated cases an even better clinical result in her private dental clinic then in Gutknecht's publication from some years ago.

Two lectures in the field of peri-implantitis therapy with lasers showed the success story in this field against classical methods. Prof Dr Herbert Deppe (University Munich) showed the significant advantages of CO_2 laser therapy against conventional therapy methods. Assoc-Prof Dr Sabine Sennhenn-Kirch-

ner (University Göttingen) presented success rates with diode and Er:YAG laser therapy. The field of periimplantitis therapy is already now the definite domain of laser therapy.

Prof Carlos de Paula Eduardo (University São Paulo) showed again very convincing results out of his preferred scientific research field in esthetic dentistry. Especially the fascinating pictures in his presentation were highly appreciated by the auditorium.

Dr Rene Franzen (AALZ, University Aachen) presented a basic lecture highlighting the importance of understanding the absorption of diode lasers in soft tissues. Dr Jörg Meister (AALZ, University Aachen) gave a lecture about the biophysical understanding of erbium lasers in dentistry. Andreas Querengässer (AALZ, University Aachen) presented interesting results of laser activated rinsing solutions in the root canal with an Er,Cr:YSGG laser. Dr Thorsten Kuypers, MSc (AALZ, University Aachen) demonstrated the successful combination of Er:YAG cavity preparation with CAD/CAM manufactured crown inlays, Dr Ralf Borchers, MSc (AALZ, University Aachen) compared different diode laser settings in oral surgery, Dr Peter Kleemann, MSc (AALZ, University Aachen) showed the exiting possibilities of laser-supported orthodontics and Dr Peter Fahlstedt, MSc (AALZ, University Aachen) presented several clinical cases with different wavelengths.

A further absolute domain of laser dentistry is laser supported pediatric dentistry. Dr Gabriele Schindler-Hultzsch, MSc (AALZ, University Aachen) showed her own Laserkids®-Concept in a Split-Mouth-Design. She showed the very high acceptance of laser dentistry by kids! Also Dr Maziar Mir, Msc (AALZ, University Aachen) presented different clinical cases in pediatric dentistry. Another highlight of the congress was the lecture of Prof Dr Dr Siegfried Jänicke (University Osnabrück) about lasers in oral and maxillofacial surgery. He stated that the CO_2-laser as scalpel substitute in oral surgery is definitive. Another profound scientist in this field is Prof Umberto Romeo (University Rome), who showed significantly better results in laser surgery in comparison with conventional methods. Also Dr Stefan Grümer, MSc (AALZ, University Aachen) gave a comprehensive lecture about periodontal surgery with a Nd:YAG laser.

Prof Dr Anton Sculean (University Bern) and Assoc-Prof Dr Andreas Braun (University Bonn) presented in their respective lectures the promising possibilities of photodynamic therapy in the field of periodontology.

A very important part of the congress was also the LASER START UP 2010. Beside the lecturers, which gave introduction lectures for dentists interested in the field of laser dentistry or starting laser dentists, also the leading dental laser companies and distributors are part of the success of the LASER START UP congresses (since 14 years), as already written for the second time now organized together with the DGL congress. Especially the Saturday is the day where introduction workshops and laser demonstrations by the companies are given. The concept of this LASER START UP congress is divided in four fields:

_Laser basics and laser physics
_Presentation of the indications in laser dentistry
_Presentation of all wavelengths in laser dentistry
_Demonstration of legal aspects and invoicing of laser therapy.

The LASER START UP 2010 and the integrated workshops and demonstrations were also this year very well visited. In the main podium at the end of the second congress day the auditorium had also the ultimate chance to discuss their view on laser dentistry with all lecturers of the congress. After an hour of intensive exchange and discussions Prof Gutknecht, DGL president, closed this very informative and successful DGL congress 2010 in Berlin._

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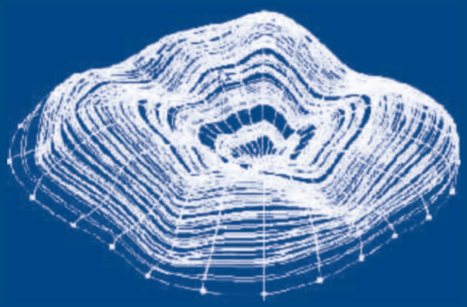

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First year of AALZ Greece full of activities!

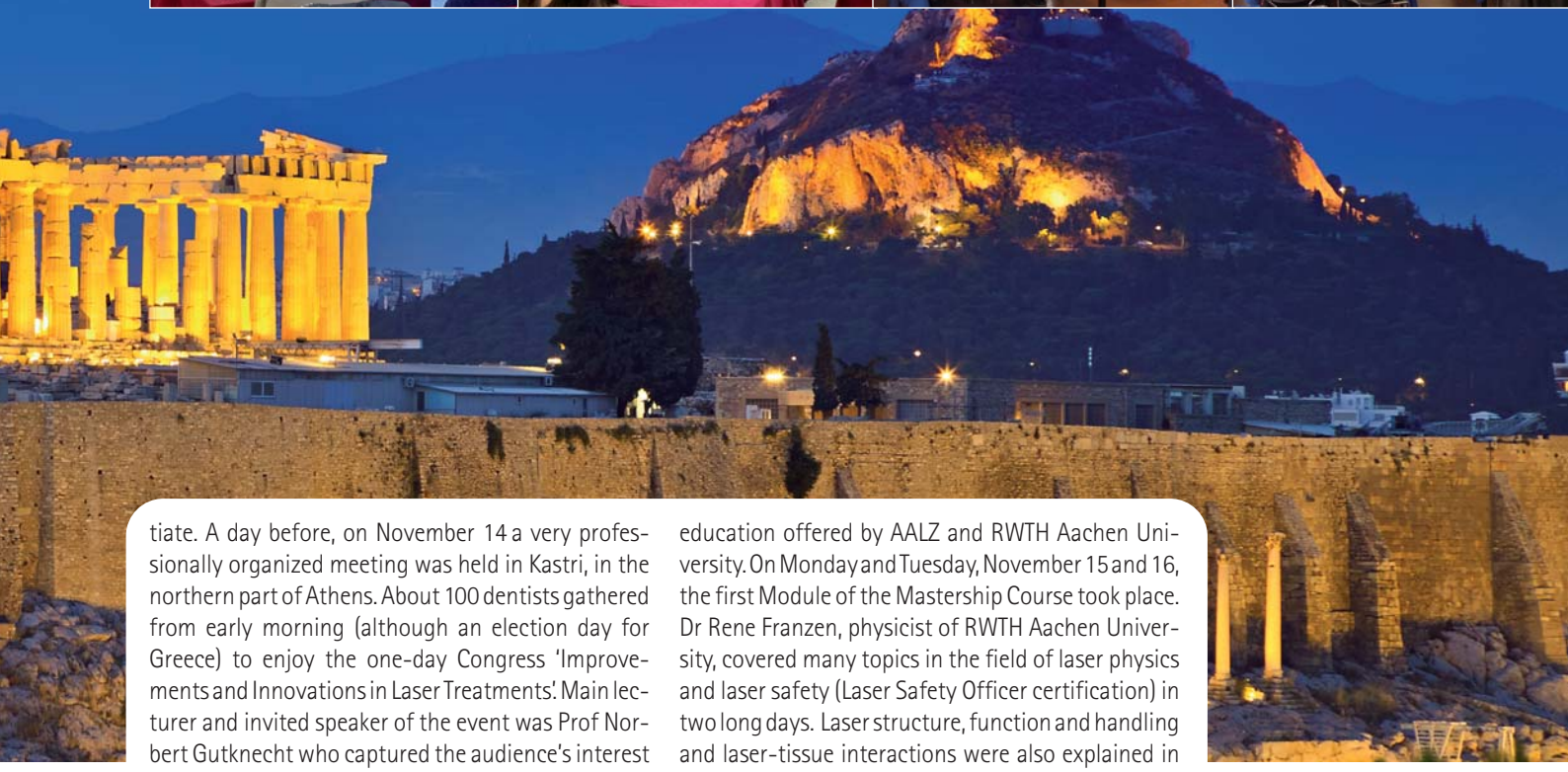
Author_Dimitris Strakas, Greece

_AALZ's vision is to educate dentists from all over the globe and make them specialists in the field of laser dentistry. The AALZ educational programs are based on fundamental laser physics, neutral and objective information on current laser systems, skill training and evidence based description of dental indications. That is the reason that AALZ has become a synonym of quality educational programs amongst dentists who are willing to buy or already use a laser system in their clinic. As with many other countries that became again clear with Greek colleagues. In 2010 AALZ Greece was established by AALZ and RWTH Aachen University adjunct faculty members Dr Antonis Kallis and Dr Dimitris Strakas. In this first year many Greek dentists have participated in our programs and added their names to the long list of our students over the years.

On January of 2010 the first Laser Safety Course was held in Athens and was followed by one more in June. During the 30th Panhellenic Dental Congress in October 2010, AALZ Greece participated with its own exhibitor booth. Supported by AALZ's General Manager Mr. Leon Vanweersch, the booth attracted the interest of many Greek colleagues, who were informed in detail about the offered accredited programs and the future scheduled dates of them.

Already in November the first Mastership/Fellowship Status Program of AALZ Greece was ready to ini-



tiate. A day before, on November 14 a very professionally organized meeting was held in Kastri, in the northern part of Athens. About 100 dentists gathered from early morning (although an election day for Greece) to enjoy the one-day Congress 'Improvements and Innovations in Laser Treatments'. Main lecturer and invited speaker of the event was Prof Norbert Gutknecht who captured the audience's interest with his three lectures on different aspects of laser dentistry, including laser assisted endodontic treatments, cavity preparations with erbium lasers and principles of periodontal therapy using Nd:YAG and diode lasers.

Very interesting lectures were also given on various topics, including marketing management of a modern dental laser office, clinical presentations of laser treatments and aesthetic facial applications with new generation laser systems. One very interesting part of the day was the on-spot live clinical applications on patients, that were taking place in a separated area of the hall and the procedure was projected via camera on screen. The audience could really watch live the treatments and the comfort of the patients during the procedure.

At the end of the day, Prof Norbert Gutknecht gave a welcome speech to the participants of the first Greek Mastership Course, emphasizing the fact that AALZ's educational programs are still the only accredited by the German Government and the European Union. Investing your professional future in laser dentistry, means that you seek the professional education offered by AALZ and RWTH Aachen University. On Monday and Tuesday, November 15 and 16, the first Module of the Mastership Course took place. Dr Rene Franzen, physicist of RWTH Aachen University, covered many topics in the field of laser physics and laser safety (Laser Safety Officer certification) in two long days. Laser structure, function and handling and laser-tissue interactions were also explained in detail. At the end of the second day Dr Franzen gave also a presentation about the ILIAS system, the extremely helpful e-learning platform that AALZ's students use throughout their studies. Although tired, the participants were extremely satisfied by the quality of Module I and this was an inspiration for them to expand their level of understanding concerning the fundamentals of laser dentistry in the upcoming Modules.

The second Module of the Mastership Course in Greece is set for 27, 28 February & 1 March 2011. Due to the intense demand of many other dentists, AAZ Greece was literally forced to repeat the first Module on 25 and 26 February 2011, thus giving the opportunity to those who apply on time to participate. For those interested please E-mail aalzgreece@gmail.com or visit the website www.aalz.gr.

The immediate success of the Mastership Course in Greece is just one more proof that the high standards and high quality of studies which AALZ offers since 1991, have set AALZ's brandname not only as pioneer but also as constant leader in laser dentistry education for dentists worldwide._

_contact laser

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"Light Time—Good Time"

3rd European Congress of WFLD in Rome

Author_Giada Gonnelli, Italy

The 3rd Congress of the World Federation for Laser Dentistry (WFLD) will be held in Rome from 9–11 June 2011 at the Department of Oral Science of Sapienza University of Rome.

_**The WFLD is the membership organization** of the specialty of laser used in dentistry worldwide. "The mission of the society is to stimulate the research in the different fields, to coordinate long-term clinical studies using lasers as main instrument during the treatment and to establish an educational foundation for dentists who are intending to use or are already using lasers in their daily treatments", the Past President of WFLD, Prof Norbert Gutknecht said in his welcome message, one of the invited speakers presenting a topic of "Minimal Invasive Caries Treatment".

"The WFLD decided to create five divisions and the European Division demonstrated to be very active. After the successful meetings of 2007 in Nice (France) and 2009 in Istanbul (Turkey), Rome takes in charge this scientific meeting", reported Prof Jean Paul Rocca, President of WFLD, one of the main invited speakers having as topic "Diode laser may combine different wavelengths—a new technical approach" adding that "Italy may be considered an advanced country in terms of laser dentistry" and concluding that the Executive Board of the WFLD look forward the meeting in Rome.

Prof Adam Stabholz, President of the European division and an invited speaker in the Endodontic section, confirmed that "It will be a unique opportunity for researchers and clinicians from many countries worldwide, in the field of laser dentistry, to share their knowledge and to learn more about the latest advancement in this area".

It wasn't a co-incidence that for the Chairperson of the congress was chosen Prof Antonella Polimeni. She is the Director of the Oral Science Department at the Sapienza University. The answer in her welcome message is: "We choose the Oral Science Department of Sapienza University to give an Academic imprint to the congress, to provide the highest quality scientific programs and the most updated information regarding the applications of lasers to our fellow colleagues."

The Chairperson of the scientific program Prof Umberto Romeo is preparing a wide program comprehending lectures, oral presentations and posters to allow everybody to participate actively to this cultural event. The deadline for abstract submission was fixed for 15 February 2011. The program will take place in a day and a half and will be divided in five different sections of dentistry: Laser Research, Endodontics, Periodontology and Implantology, Operative and Paediatric Dentistry, Oral Surgery and LLLT. Each section will have oral presentations and one or two invited speakers. For the first time in the history of WFLD, it has been decided to have an renowned invited speaker, that will present the state of art in field of his specialty followed

by another renowned invited speaker, that will present the potentiality of laser in that field. For example in the Endodontics Section Prof Giuseppe Cantatore from Italy, one of the most important Endodontists in Europe, will speak about the last innovations in Endodontic followed by Prof Adam Stabholz, the Dean of the Faculty of Dentistry at the Jerusalem University and the Head of the Endodontic Department, that will present the potentially of Lasers in Endodontics. "Prof Wilder Smith Petra from Beckman Laser Institute of University of California, Prof Yossi Shapira, Head of the Paediatric Dentistry Department at Hadassah University of Jerusalem and Prof Anton Sculean, Chairman of the Department of Periodontology, Dental School at the University of Bern, are among the invited speakers" reported Romeo, concluding that "contextually there will be a series of workshops organized by the leading laser companies that will take place on Thursday morning as well as the Basic Laser Course that will give the opportunity to get the certification of the WFLD"

"But what does the title of the congress say?: Light Time is for us fans of laser also Good Time ", added Prof Roly Kornblit, Chairperson of Organizing Committee. So we are preparing a social program that will exalt the beauty and the specialty of the city of Rome, demonstrating also the social and cultural characteristic of

this beautiful country, already Thursday evening, after the opening ceremony, during the welcome cocktail, typical Italian food and famous Italian wines will be served. After the cocktail it will be possible to participate to a tour by bus and see Rome by night. The social dinner was fixed for Friday evening in one of the most important monuments of Rome, the "Terrazza Caffarelli at the Museum Capitolini", an informal moment for exchanging different views of laser enjoying a unique view of Rome. For those who will remain in Rome, we are organizing a guide tour to the famous "Villas of Tivoli" and a dinner with music in a tram that goes around the city center of Rome at the end of the congress on saturday afternoon._

_information laser

www.wfld-ed-rome2011.com

Revolutionary laser system was presented in Israel

Author_Georg Isbaner, Germany

_During an extraordinary training session in Tel Aviv, Israel, a revolutionary type of dental lasers has been presented to the participants. This new technology seems to resolve most of the main technological hurdles in laser dentistry.

In co-operation with NMT Munich, Germany, and Syneron Dental Lasers dentists from Germany and Bulgaria had the chance of getting to know the ground breaking laser technology. The LiteTouch™ Er:YAG-Laser (wavelength 2,940 nm) works with the so called "Laser-in-the-Handpiece™"-technology. Thereby the laser is generated in the handpiece itself and does not need to be transmitted via fibre of a laser engine. This new design is a revolution in itself. The previous fibre technology is too susceptible to failure and thus too expensive in maintenance.

Therefore, the technological risk is also an economical risk for the investing dentist. Not few dentists bought expensive laser machines in the past and realized that they were not suitable for everyday use.

The LiteTouch™ provides the doctor with the security and handling flexibility which is needed for a successful therapy. Ira Prigat, President of Syneron Dental Laser, sums it up: "With a conventional laser with a fibre the dentist cannot concentrate fully on his job. He needs to be concerned about the bulky, susceptible and pricey fibre." – And this is where Syneron comes up with the solution.

In 2007, physicists, engineers and laser specialists came up with a new laser concept: the "Laser-in-the-Handpiece™"-technology. This compression is a milestone in industrial history. Furthermore the LiteTouch™ can be used for soft and hard tissue therapies and covers a vast spectre of indications: implantology, restorative dentistry, periodontics, paediatric dentistry and soft and hard tissue surgery etc.

Especially with the possibilities of minimal invasive treatment unnecessary traumata of healthy tissue can be avoided. In addition a new range of dental therapy opens up. The wound healing improves due to

the disinfecting effect of the laser. The patient can anticipate less swelling and bleeding. Obviously, this is not a unique feature of the LiteTouch™—however its flexibility, controllability, indication spectre, its efficiency, reliability and compactness seem to be unparalleled.

Prigat emphasises as well that the outer design has a decisive impact on the daily practice: "Ultimately we treat humans, and if our patients are already intimidated by the enormous size and noise of the laser engine, we cannot use the laser as often as we would like to. And this is not economical." In contrast the LiteTouch™ is a very small and compact device which weights just about 20 kilos and is just as big as a common computer terminal. One can imagine that in the future this new technology is a fully integrated part of the treatment unit.

Asked how Syneron wants to approach such a conservative market like Germany, Prigat said that a tailor made concept is decisive. "What are the requirements and demands? It is not enough to sell a laser. Long-term support is necessary. You cannot change the work habit of a dentist from one day to the other. That is why we train our customers step-by-step with the help of our German distributors." This intention was met by the personal training of the German dentists in Israel.

In his seminar, Dr Avi Reyhanian, renowned international laser specialist from Israel, demonstrated the practical advantages of periodontal therapy with the LiteTouch™. Dr Mark Levin, Tel Aviv, addressed the advantages of the D-Touch™ (wavelength 810 nm, 980 nm) that can be used in periodontics, endodontics and soft tissue management. In bio-stimulation and aesthetic therapy the D-Touch™ can be used as well. This was confirmed in Dr Levin's clinic during the next day, where the participants could follow several laser treatments via live video stream.

The Israel journey was completed by visits to the best restaurants in Tel Aviv in the evening and a historical trip to Jerusalem and the Dead Sea. All together, the participants were convinced by this extraordinary event. They will return home with new ideas for their own laser dentistry._

International events

2011

Start Mastership Course „Lasers in Dentistry" Scandinavia—Batch 2
Where: Akersberga/Stockholm, Sweden
Date: 7–10 January, 2011
Websites: www.ilsd.se, www.aalz.de

ALD 2011
Where: San Diego, CA, USA
Date: 3–5 March 2011
Website: www.laserdentistry.org

IADR 89th General Session & Exhibition
Where: San Diego, CA, USA
Date: 16–19 March 2011
Website: www.iadr.org

34th International Dental Show
Where: Cologne, Germany
Date: 22–26 March 2011
E-mail: ids@koelnmesse.de
Website: www.ids-cologne.de

33rd Asia Pacific Dental Congress
Where: Manila, Philippines
Date: 3–6 May 2011
Website: www.apdc2011.com

3rd European Congress World Federation for Laser Dentistry (WFLD)
Where: Rome, Italy
Date: 10 & 11 June 2011
Website: www.wfld-org.info

FDI Annual World Dental Congress
Where: Mexico City, Mexico
Date: 14–17 September 2011
Website: www.fdiworldental.org

Annual Congress of DGL
Where: Düsseldorf, Germany
Date: 28–29 October 2011
Website: www.startup-laser.de

Greater New York Dental Meeting
Where: New York, NY, USA
Date: 25–30 November 2011
Website: www.gnydm.org

2012

LaserOptics Berlin
Where: Berlin, Germany
Date: 19–21 March 2012
Website: www.laser-optics-berlin.de

IDEM International Dental Exhibition
Where: Singapore
Date: 20–22 April 2012
Website: www.idem-singapore.com

Bella Center
Copenhagen

APRIL 7- 9, 2011 • BELLA CENTER • **COPENHAGEN** • DENMARK

Welcome to the 44th Scandinavian Dental Fair
The leading annual dental fair in Scandinavia

SCANDEFA 2011

The 44th SCANDEFA invites you to exquisitely meet the Scandinavian dental market and sales partners from all over the world in springtime in wonderful Copenhagen

SCANDEFA, organized by Bella Center, is being held in conjunction with the Annual Scientific Meeting, organized by the Danish Dental Association (www.tandlaegeforeningen.dk).

More than 200 exhibitors and 11.349 visitors participated at SCANDEFA 2010 on 14,220 m^2 of exhibition space.

Reservation of a booth
Book online at www.scandefa.dk
Sales and Project Manager, Jo Jaqueline Ogilvie
jjo@bellacenter.dk, T +45 32 47 21 25

Travel information
Bella Center is located just a 10 minute taxi drive from Copenhagen Airport. A regional train runs from the airport to Orestad Station, only 15 minutes drive.

Book a hotel in Copenhagen
www.visitcopenhagen.com/tourist/plan_and_book

Fotos from Bella Center, Wonderful Copenhagen

www.scandefa.dk

"Lasers in Dentistry"

12th Master of Science course at RWTH Aachen

Authors_Leon Vanweersch, Dominique Vanweersch, Aachen

_The 12th master course "Lasers in Dentistry" started on 8 September 2010 in Aachen, Germany, and course number 13 started on 26 September in the city of Ras Al Khaimah in the United Arab Emirates. This postgraduate Master of Science programme has been offered since 2004 at the RWTH Aachen University and has already more than 180 graduates from all countries around the world.

The Rector of RWTH Aachen University, Prof Dr Schmachtenberg, inaugurated officially in Aachen the course and welcomed the 19 candidates who will get a taste of student's life again. He introduced the University of Excellence (RWTH Aachen University) where they will study beside their daily work in their clinics for the next two years.

All important theories and application options pertaining to laser use in dentistry are taught. The participants obtain sound theoretical knowledge in lectures and seminars led by renowned, competent and experienced international scientists. Skill training sessions, exercises, practical applications, live operations and workshops guide the master students towards using lasers successfully and professionally in their own clinics. During the ten modules, students remain in steady contact with the RWTH Aachen University and the lecturers between attendance days via the ILIAS e-learning system. This kind of segmentation allows established dentists to remain active in their clinics while getting their accredited Master of Science degree. Scientific Director of this course is Prof Dr Norbert Gutknecht, Professor at RWTH Aachen University, Director of the AALZ—Aachen Dental Laser Center, President of the German Dental Laser Society (DGL) and Executive Director and Past President of the World Federation for Laser Dentistry (WFLD). Leaders of the profession—outstanding professors are on the staff. "Postgraduate education by the best professors in the fields of physics, medicine and dentistry is in my opinion the ideal situation", says Dr Dimitri Strakas from Greece—one of the first graduates in this master course. He states furthermore: "The organisation and realisation of this master course is very professional. For those dentists who want the best clinical and scientific backgrounds, I see no alternative options to this course from RWTH Aachen University."

The RWTH Aachen University Master of Science course "Lasers in Dentistry" is the first and only accredited laser dentistry Master program in Germany and indeed in Europe, recognized in the EU and all countries of the Washington Accord (USA and Anglo-American nations) and of the Bologna Reform as an internationally valid academic degree.

The next courses start in September 2011 and registrations are already open (www.aalz.de)._

submission guidelines:

Please note that all the textual components of your submission must be combined into one MS Word document. Please do not submit multiple files for each of these items:

_the complete article;
_all the image (tables, charts, photographs, etc.) captions;
_the complete list of sources consulted; and
_the author or contact information (biographical sketch, mailing address, e-mail address, etc.).

In addition, images must not be embedded into the MS Word document. All images must be submitted separately, and details about such submission follow below under image requirements.

Text length
Article lengths can vary greatly—from 1,500 to 5,500 words—depending on the subject matter. Our approach is that if you need more or less words to do the topic justice, then please make the article as long or as short as necessary.

We can run an unusually long article in multiple parts, but this usually entails a topic for which each part can stand alone because it contains so much information.

In short, we do not want to limit you in terms of article length, so please use the word count above as a general guideline and if you have specific questions, please do not hesitate to contact us.

Text formatting
We also ask that you forego any special formatting beyond the use of italics and boldface. If you would like to emphasise certain words within the text, please only use italics (do not use underlining or a larger font size). Boldface is reserved for article headers. Please do not use underlining.

Please use single spacing and make sure that the text is left justified. Please do not centre text on the page. Do not indent paragraphs, rather place a blank line between paragraphs. Please do not add tab stops.

Should you require a special layout, please let the word processing programme you are using help you do this formatting automatically. Similarly, should you need to make a list, or add footnotes or endnotes, please let the word processing programme do it for you automatically. There are menus in every programme that will enable you to do so. The fact is that no matter how carefully done, errors can creep in when you try to number footnotes yourself.

Any formatting contrary to stated above will require us to remove such formatting before layout, which is very time-consuming. Please consider this when formatting your document.

Image requirements
Please number images consecutively throughout the article by using a new number for each image. If it is imperative that certain images are grouped together, then use lowercase letters to designate these in a group (for example, 2a, 2b, 2c).

Please place image references in your article wherever they are appropriate, whether in the middle or at the end of a sentence. If you do not directly refer to the image, place the reference at the end of the sentence to which it relates enclosed within brackets and before the period.

In addition, please note:

_We require images in TIF or JPEG format.
_These images must be no smaller than 6 x 6 cm in size at 300 DPI.
_These image files must be no smaller than 80 KB in size (or they will print the size of a postage stamp!).

Larger image files are always better, and those approximately the size of 1 MB are best. Thus, do not size large image files down to meet our requirements but send us the largest files available. (The larger the starting image is in terms of bytes, the more leeway the designer has for resizing the image in order to fill up more space should there be room available).

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You may submit images via e-mail, via our FTP server or post a CD containing your images directly to us (please contact us for the mailing address, as this will depend upon the country from which you will be mailing).

Please also send us a head shot of yourself that is in accordance with the requirements stated above so that it can be printed with your article.

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An abstract of your article is not required.

Author or contact information
The author's contact information and a head shot of the author are included at the end of every article. Please note the exact information you would like to appear in this section and format it according to the requirements stated above. A short biographical sketch may precede the contact information if you provide us with the necessary information (60 words or less).

Questions?
Eva Kretzschmann
e.kretzschmann@oemus-media.de

Manufacturer News

Sirona

Training for laser users

Safety is of paramount importance when laser treatment is being carried out. It is vitally necessary that dentists should have completed a certified training course of the type offered by Sirona. Our training course provides comprehensive and hands-on tuition on all aspects of the use of lasers, as well as giving users useful tips on safety and clinical application.

Details of the training and continuing education course provided by the Sirona Dental Academy may be found on www.sirona.de under the heading "Service" or on the product pages of SIROLaser Advance and SIROLaser Xtend.

Safety when using a laser begins with the selection of a suitable surgery. The door of the surgery must display a warning sign. No unauthorised persons must be allowed to enter the surgery while treatment is being carried out. Patients and all other persons present must wear laser protection glasses to prevent injuries to the eyes. The law requires that there must be a laser safety officer present in practices using a class 3b and 4 dental laser and that this officer must hold proof of specialised knowledge and expertise in the clinical application of lasers and laser protection. As the first point of contact within the practice on questions relating to the laser, this person is responsible for guaranteeing and monitoring certain safety standards.

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

LIMO

Two parallel wavelengths for quick, uncomplicated surgical treatment

At the BIOS 2011 (booth 8601) LIMO presents the particularly compact diode laser with a wavelength of 1,470 nm that has been supplemented by an additional parallel wavelength: 980 nm, 940 nm or 810 nm. This long established standard wavelength on the medical market, combined with the expedient wavelength of 1,470 nm, can be individually controlled. The power rating of the fiber-coupled laser is 15 W and 30 W. On request, a power rating of >100 W can also be supplied. The dimensions of the potential-free housing are greatly reduced but, however, completely equipped: protective window, fiber contact switch, monitor diode and pilot laser are already integrated. The combination of a compact design with all additional and safety features makes it suitable for integration into OEM appliances, without causing additional development and production costs. Furthermore, the high-performance laser module makes it possible for the end user to operate at practically all working and ambient temperatures and in nearly all operating modes of cw up to the most varied pulsed conditions. Without exception, the LIMO diode laser modules are maintenance-free, so that flexible warranty periods can be provided. This has the advantage that costs are completely eliminated in the event of replacement. The product is optimally suitable in the end use for medical treatment in the field of modern surgery and urology. The two wavelengths make higher absorption possible of the laser in water and haemoglobin. In addition to the high removal rates, the treatment can be carried out ambulant, quick and with care. Further advantages for operative treatment are:

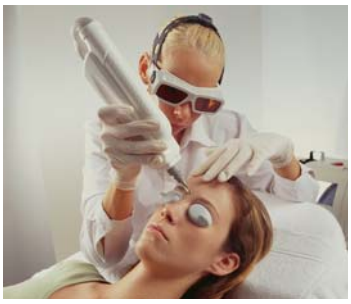
– safe and high precision treatment (less bleeding, protection of the adjacent tissue)
– minimum postoperative complaints
– quick, uncomplicated healing (no stitches)

LIMO
Lissotschenko Mikrooptik GmbH
Bookenburgweg 4–8
44319 Dortmund, Germany
E-mail: kontakt@limo.de
Web: www.limo.de

Laservision

New multi-use laser safety eyecaps for patients

During medical laser treatment eye protection of the patients is extremely important. By offering the completely novel laser safety eyecaps "CAP2PROTECT" LASERVISION takes care of this challenge and provides patients excellent eye protection for laser treatment in the facial area. Present eye caps are made in most cases out of rigid material like metal or plastics. They are typically connected together with a nose bridge and hold in position by an additional head strap. In contrast to that the new LASERVISION eye caps feature a unique self-adhesive effect. This effect is a basic material characteristic and doesn't become lost even after multiple reuses. The adhesive part of the cap keeps it securely in a position which protects the eye of the patient against incident laser radiation and stray light from all directions. As designed for the medical market, the caps are of course suitable for sterilisation. In order to increase laser protection and mechanical stability the eye caps feature an additional metal insert on the top side. Due to its small size and thickness the wearing comfort is not affected at all.



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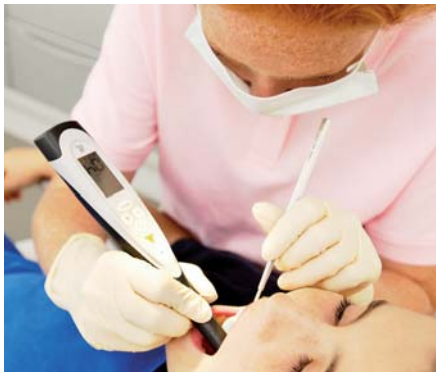
Siemensstr. 6
90766 Fuerth, Germany
E-mail: info@lvg.com
Web: www.uvex-laservision.com

KaVo

Early identification of caries—pain-free and safe

The KaVo DIAGNOdent pen, a unique instrument for diagnosing caries, utilises the differing fluorescence of healthy and diseased tooth substance to quickly and reliably identify early-stage caries. In addition to caries detection, the DIAGNOdent pen can be used with a special Perio probe for the reliable and comfortable identification of periodontitis.

This patented diagnostic system is small, compact and cable-free. The DIAGNOdent pen even allows the diagnosis of hidden caries which is difficult to find with a probe or X-ray since it is below the intact enamel surface. Even very fine lesions are reliably revealed without exposing patients to radiation. Caries can also be easily identified in the approximal area with a new, special approximal probe. With the approximal prism, the laser beam is deflected 100° to allow the scanning of the tooth around the contact



surface. The entire approximal area can be scanned in quadrants in just a few minutes. The DIAGNOdent pen's actual readings are communicated as a digital and acoustic signal. This confirms to the patient, the need for treatment and greatly increases compliance. In addition to the detection of caries, the DIAGNOdent pen also detects calculus in periodontal pockets. 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. Residual concrements can be confidently removed. A gentler, more thorough cleaning of pockets is thereby enabled with substantially enhanced healing, whilst saving the user time by avoiding unnecessary treatment.

Clinical studies by Prof Frentzen, M.D. at the University of Bonn, confirm that the use of the DIAGNOdent Perio probe for concrement detection and control of treatment improves the postoperative bleeding index and noticeably reduces pocket depth in comparison to the use of a conventional probe.

Overall, the DIAGNOdent pen—a state-of-the-art instrument for reliable caries and calculus detection—is an ideal addition to the diagnostic repertoire of any dental practice.

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

Fotona

PIPS® Revolutionizing New Root Canal Treatment Available Only with Fotona Lasers

Fotona has signed an agreement which gives Fotona dental lasers exclusive rights to perform PIPS®, a groundbreaking new photoacoustic root canal treatment. PIPS® uses Er:YAG laser energy at sub-ablative power levels for cleaning and debriding the root canal system with specially designed handpieces and fiber tips. It is a minimally invasive technique because the tip is only inserted one third deep into the coronal canal. This also gives the peace of mind that the tip will not break inside the curved canal. Shockwaves created by the laser stream cleaning solutions twice as deep through the root canal system as could be

achieved using traditional methods, in this way reaching every corner and making the procedure that much more effective. The canals and subcanals are left clean and the dentinal tubules are completely free of smear layer.

Additional advantages of PIPS® include preserving more of the tooth endoskeleton because of its minimal invasiveness and the technique requires less filling and soaking time for chemical agents, saving you up to 30 minutes depending on the complexity of the root canal structure.

Fotona d.d.
Stegne 7
1210 Ljubljana, Slovenia
E-mail: info@fotona.com
Web: www.pips-endo.com
www.fotona.com

elexxion

OdoBleach for laser power bleaching with elexxion diode lasers

Elexxion, an established manufacturer of high-quality dental lasers that feature German technology and design, has just launched OdoBleach, a special new bleaching set. Used in combination with an elexxion diode laser, OdoBleach is the preferred choice for laser power bleaching. With OdoBleach, treatment can now be completed in only one single session, which of course results in a significant increase in productivity and practice revenue performance. OdoBleach contains titanium dioxide and hydrogen peroxide, and the combined effect is intensified by the use of an elexxion diode laser. OdoBleach is specifically developed to achieve optimal results with the wavelength of elexxion devices. This new bleaching technology means fast-acting treatment, no surface alteration, no hypersensitive reaction and exceptional economic efficiency. Each OdoBleach set includes a liquid dam and desensitization syringe, to give patients gleaming white teeth in a single session. That makes it easier to schedule appointments efficiently and calculate costs. All elexxion products are available through our regional distributors.

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78315 Radolfzell, Germany
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Web: www.elexxion.com

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international magazine of laser dentistry

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