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Introduction

"Laser in Health Science" has been designated the main theme of the 17th Congress of the World Federation for Laser Dentistry. Various scientific programs including many lectures and symposia by some of the world's most renowned specialists in the field, general oral and poster presentations, workshops, and much more, are planned. These programs will raise the level of scientific research and broaden knowledge in laser dentistry, providing profound satisfaction for all participants.

Numbers are impressive: 99 speakers, 35 short oral presentations, 58 poster presentations, 15 workshops, and more than 350 participants from 23 countries. We would like to especially thank over 20 companies that have financially supported and put their trust into this event featuring research in health and odontology laser.

The team had a very clear objective, which was to bring speakers who could deliver the latest research in the field of light. It is astounding how far science has come in the last few years, regarding the use of laser in treating several pathologies, such as oral mucositis, photobiomodulation of stem cells to regenerate dental tissues, treatment of infections resistant to antibiotics with photonic therapies and antimacrobial Phoyodynamic Therapy (aPDT), the use of vacuum therapy to control pain, improve sleep quality, esthetic facial harmonization, remineralization of white spots, dental bleaching with violet leds, the use of Er:YAG laser to remove dental caries preserving healthy tissues and removal (debonding) of porcelain facets and onlays. This arsenal of innovations has led to the choice of the central topic of the present Congress: Laser in Health Science.

Two round-table discussions are part of the scientific grid. The first one will approach the topic of Periodontits & Periimplantits and Laser Treatment. The second, with the presence of the current and 3 Past Presidents of World Association for PhotobiomoduLation Therapy (WALT), will be on photobiomodulation (PBM). Both round-tables will have the presence of the most renowned researchers in the field of their respective topics.

Inaugural lectures is another innovation brought by this event, featuring 2 internationally acknowledged researchers, Prof. Enwemeka Chukuka (USA) and Prof. Vanderlei S. Bagnato (Brazil and USA).

Assoc. Prof. Kinga Grzech-Leśniak
Chairperson of the Organizing Committee

Key words: lasers, laser dentistry, photobiomodulation, peri-implantitis, periodontitis

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Er:YAG laser-assisted comprehensive periodontal pocket therapy (Er-LCPT)

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Abstract

Recently, lasers are being increasingly used in periodontal therapy because of their various advantageous therapeutic effects such as ablation, hemostasis, bactericidal effect, as well as biostimulation. Among various lasers, the Er:YAG laser is the most suitable for periodontal treatment because it exhibits effective ablation of periodontal hard and soft tissues, with minimal thermal side effects, and thereby does not impair wound healing. To date, a number of clinical studies for periodontal pocket treatment using Er:YAG laser have been published and some reported positive results; however, a consensus has not yet been reached regarding its effects due to differences in methods and parameters of irradiation for pocket therapy. This presentation introduces a novel procedure, using Er:YAG laser combined with conventional mechanical treatment (Er:YAG laser-assisted comprehensive periodontal pocket therapy; Er-LCPT). The Er-LCPT is a minimally invasive flapless surgery that enables safe, effective and comprehensive debridement of periodontal pockets. In the treatment of residual pockets, the effectiveness and safety of this procedure have been confirmed by a case series. Also, significantly improved outcomes of clinical parameters have been detected by a randomized controlled trial of Er-LCPT when compared to scaling and root planing (SRP) alone. Furthermore, Er-LCPT may also be used as a regenerative therapy in limited cases during initial therapy.

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(Online) Esthetic soft tissue management with Er:YAG laser

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Abstract

Compared to other laser systems, the Er:YAG laser is very effective in soft tissue management with dramatically lower thermal side effects, and has become one of the most promising lasers for periodontal esthetic soft tissue surgery. The application of the Er:YAG laser, sometimes in combination with a surgical microscope, renders the procedure more feasible. It becomes possible to deal with the soft tissues more delicately, thus yielding more satisfactory results, compared to those obtained by conventional methods. In this presentation, I introduce the Er:YAG laser application in gingivectomy/gingivoplasty, melanin removal, and metal tattoo removal.

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Workshop: Periodontal and peri-implant therapy using Er:YAG laser

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Abstract

Recently, various lasers have been used for a wide range of oral conditions. Lasers have numerous advantageous physical properties such as ablation, hemostasis, bactericidal effect as well as photobiomodulation, making it suitable for treating inflammatory and infectious conditions. Thus, the use of lasers is considered safe and effective for treating oral diseases such as periodontitis and peri-implantitis. In periodontal and peri-implant applications, the Er:YAG laser has various advantageous properties such as the extremely low thermal side effects to soft tissues, the high decontamination and detoxification effects on the diseased site, the pronounced bleeding from the laser-treated bone surface, as well as the potential photobiomodulation effects. The Er:YAG laser would be a suitable preparation tool for periodontal regenerative surgery. Given these observations, the Er:YAG laser has been recently established as one of the most promising laser systems in periodontal, esthetic and peri-implant therapy. In this presentation, the current clinical applications of the Er:YAG laser for soft tissue management, periodontal nonsurgical and surgical therapy, osseous surgery, peri-implant therapy, and esthetic treatment will be discussed, based on scientific evidence from currently available basic and clinical studies as well as case reports. In particular, Er:YAG laser-assisted comprehensive periodontal pocket treatment (Er-LCPT) will be introduced.

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Innovations in lasers in dentistry: Surgical and non-surgical applications from prevention to regeneration

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Abstract

The dental laser has been a popular tool since its introduction in 1989, but there have been many uncertainties about its efficacy for various soft and hard tissue surgical procedures. These ablative effects are based on well-understood high-power laser–biological tissue interactions termed photothermal (PTT) responses. Tremendous progress in biophotonics technologies has improved clinical outcomes, reduced costs, and broadened their applications. Further, concurrent progress in the biological basis of light-activated molecular pathways has enabled the development of two other non-surgical approaches, namely, photodynamic therapy (PDT) and photobiomodulation (PBM) therapy. The latter has gained much evidence from controlled human clinical studies to be recommended as a standard of care in supportive cancer care. Research on PBM molecular mechanisms, biomarkers and clinical dosing has enabled this treatment to become a significant approach for regenerative clinical dentistry. This talk will outline the salient features and differences between PTT, PDT and PBM therapy while emphasizing the recent advances in individual applications based on mechanistic biological interactions.

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Contemporary dental ceramics and cements

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Abstract

The use of all-ceramic restorations has dramatically increased in the past two decades due to increasing demand for improved esthetics, advances in ceramics development and concerns about the biocompatibility of metals. Porcelain fused to metal and even layered ceramic restorations are gradually being replaced with monolithic restoration that does not only exhibit excellent mechanical properties, but also enhances translucency.

As this evolution in dental materials continues, confusion about material choice, cementation/bonding and surface treatment is widespread. Clinicians are seeking ways to navigate both material choice and cementation protocols. Unfortunately, there is not an ideal combination of materials that are suitable for every clinical scenario. The goal of this contemporary dental ceramic and cements overview is to provide a brief understanding of available materials on the market and discuss how the properties of both the ceramic and cement perform together.

The learning objectives of this presentation are:

1. Introduction to ceramic materials
2. Classification of dental ceramics
3. Fabrication processes of dental ceramics
4. Sintering process and its importance
5. Properties of dental ceramics
6. Integrating modern ceramics into daily practice
7. Role of digital dentistry technologies in utilizing ceramics
8. Preparation designs and luting protocols

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(Online) Steering multipotent mesenchymal cells towards an anti-inflammatory and osteogenic bias through photobiomodulation therapy: Achieving dual benefits

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Abstract

The multipurpose features and clinical applications of bone marrow-derived multipotent mesenchymal cells (MSCs) have captured scientific interest. Mesenchymal cells not only exert bone-building and niche anabolic tasks but also possess the ability to quench inflammation and restore inflamed tissues, extending their range of activities to conditions such as neurodegenerative diseases, immune disorders, and various forms of osteopenia. Manipulating MSCs has become necessary for them to become an effective therapeutic tool. Photobiomodulation therapy (PBM-t) can be used to render MSCs an extraordinary anti-inflammatory and osteogenic instrument by improving their plasticity and secretome. Laser pre-conditioning and PBM-t protocols improve the anti-inflammatory and osteogenic capacity of MSCs, prompt these multipotent stem cells towards a predefined lineage commitment and secretome, and improve their viability and proliferation. Consistent therapeutic approaches are essential in considering the physical properties of light, the reliability of laser parameters, and individual patient needs. The field needs to shift from pre-clinical evidence to reliable therapies, which involve determining the effectiveness, safety, posology, and clinical utility of PBM-t protocols. Our research team suggests that delivering 808-nm infrared light at 1 W and 60 J/cm^2 (60 s) through a flat top handpiece (1 cm^2) is a promising strategy for improving MSC differentiation, secretion and anti-inflammatory capabilities, establishing the clinical utility of this approach.

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Are the multi-wavelength diodes a luxury or a necessity?

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Abstract

Background. The clinical application of lasers in oral soft-tissue surgery has continued to expand in the last two decades. Diode lasers are becoming quite popular due to economic and ergonomic considerations. Diode wavelengths in the visible spectrum (450 and 650 nm) and in the near-infrared spectrum (980 nm) are widely used in dentistry.

Clinical implications. Diode laser wavelengths are absorbed mainly by hemoglobin and melanin. Differences in their absorption characteristics require amendment of the treatment protocols for each wavelength, including the laser settings (energy and exposure duration) and mode of application (contact or noncontact). Soft tissue ablation, disinfection, biostimulation, and hemostasis without causing collateral thermal damage are the desired clinical outcomes that could be achieved by using the appropriate diode wavelengths to target the specific chromophores at various depths in the oral tissues. The 450-nm wavelength has greater absorption in hemoglobin and melanin compared to other infrared wavelengths. This provides an opportunity to achieve tissue ablation using the photothermal effect (noncontact mode) and more efficient coagulation. The 980-nm wavelength has deeper penetration than 450 nm, which leads to remarkable disinfection in periodontal diseases. The 650-nm wavelength is one of the optimal wavelengths for photobiomodulation due to its deep penetration and ability to irradiate the deep tissues with relatively low energy that accelerates wound healing and relieves pain.

Conclusions. Understanding the optical properties and absorption characteristics of diode laser wavelengths is the key to achieve the clinical goals without causing collateral thermal damage.

Educational objectives.

- Outline the biologic laser–tissue interaction of different diode laser wavelengths.
- Determine how to select between the different diode wavelengths.
- Employ the absorption characteristics of diode wavelengths to achieve the ideal clinical goals.

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Laser applications in implantology: Advantages and limitations

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Abstract

Different types of lasers can be applied to implants. In this review, we will assess the advantages and limitations of the use of lasers in implantology. We can apply the laser at different times: during the preparation of the bone bed, during the second surgical phase or as therapy in mucositis and peri-implantitis.

In this session, we will discuss the use of different lasers in each of 3 phases of implantology. Regarding bone preparation, we will discuss what types of lasers can be used for drilling the bone bed as well as we will describe their advantages and limitations. Photobiomodulation during implant osseointegration will be reviewed exposing its advantages and limitations, depending on the type of laser used.

In the second-stage surgery of submerged healed implants, the use of a Er,Cr:YSGG laser is successful, but implants located in esthetic zone or in areas surrounded by keratinized mucosa are a problem. We propose a new technique to improve this procedure. Instead of eliminating all the keratinized mucosa,we recommend a rolling-flap, thereby moving the keratinized mucosa in palatine zone to the buccal zone and preserving it to the maximum.

A number of laser systems have been used in the different phases of peri-implantitis treatment. Depending on the operating wavelength involved, lasers can be used in different phases with the aim of securing the best results. In this regard, CO_2, Er:YAG, Er,Cr:YSGG, diode, and photodynamic therapies have been used for the decontamination of implant surfaces.

In non-surgical peri-implantitis treatments, lasers are used to decontaminate the implant surface and to reduce inflammation of the peri-implant mucosa. Some laser systems are better suited for application in this phase, since such procedures do not involve the raising of a tissue flap. In this regard, optical fiber lasers are the ideal choice.

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From the mouth and nose to the lungs: Treating antibiotic-resistant infection with photonic techniques

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Abstract

Nowadays, for any of the actions in the area of health, including dentistry in a remarkable way, the treatment of infections caused by bacteria resistant to antibiotics, including those of the respiratory tract, are preponderant. In this presentation, we will discuss new techniques that should allow the breakdown of bacterial resistance using light oxidative stress as well as applications for the treatment of antibiotic-resistant infections of the entire respiratory and digestive tract.

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(Online) Laser nanotechnologies in the treatment of dentin hypersensitivity

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Abstract

Background. Dentin hypersensitivity (DH) is one of the most common complications that affect patients after periodontal therapy. So far, many investigators have successfully used different types of lasers in DH treatment. The proposed method envisages treatment of dentine hypersensitivity by application of nanoparticles onto tooth sensitive surface. The method is distinguished by the use of nanoparticles of calcium fluorine apatite (CaFAP) and irradiation by CO_2 and Er:YAG lasers.

Objectives. Development of effective treatments for dentin hypersensitivity by using nanolaser technologies.

Materials and methods. Sixty extracted human teeth with dentine hypersensitivity stored in the physiological saline solution were assigned to the 3 different experimental groups. The first group was the control group. The samples in the second group were covered with nanodispersed fluorine apatite and irradiated with the Er:YAG laser (0.5 W, 50 Hz, 5 times × 5 s). The samples in the third group were covered with nanodispersed fluorine apatite and irradiated with CO_2 laser (0.5 W, 5 s, 5 times). The samples were cut longitudinally with a diamond-coated band saw ("Trennschleif System"; Exakt, Norderstedt, Germany) and studied under the scanning electron microscope.

A group of 9 patients with a total of 63 chronic hypersensitive teeth were selected. Each one of them had at least 3 hypersensitive teeth. These teeth were randomly allocated into 3 groups. Group 1, control; group 2, teeth were covered by nanodispersed fluorine apatite and irradiated with the Er:YAG laser (0.5 W, 50 Hz, 5 times × 5 s); and group 3, teeth were covered with nanodispersed fluorine apatite and irradiated with CO_2 laser (0.5 W, 5 s, 5 times)

Assessment of pain was performed by a visual analogue scale (VAS) after stimulation of sensitive tooth by using the sharp tip of an explorer. This test was performed before treatment, immediately after treatment and at 1-, 3- and 6-month intervals after treatment by one blinded examiner. The analysis of VAS score between the 3 groups at the time of treatment did not show any significant difference ($p = 0.506$). However, by using repeated-measurement analysis of variance test, significant differences were observed in the 3 groups between before-treatment VAS score and after treatment ($p < 0.0005$).

Results. Fluorine apatite nanoparticles penetrate into open dentinal microtubules and make obturation. The next laser irradiation induces photothermal activation, and the melting of nanoparticles. The wavelength of laser irradiation lies at the maxima of the spectral absorption of calcium fluorine apatite (CO_2 laser – 10.6 microns or Er:YAG laser is 2.94 microns). The energy regimes of laser irradiation were determined by computer simulation correlated with experimental and clinical results.

Conclusions. The proposed method provides reliable, durable and natural CaFAP adhesion in microtubule orifices – obturation and effective re-mineralizing function on the hypersensitive dentin surface.

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Biomodulation with flat top handpiece

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Abstract

Photobiomodulation (PBM) has been used in clinical practice for more than 40 years and its mechanisms of action on cellular and molecular levels have been studied for about 30 years. In clinical applications, PBM has been used to successfully induce wound and bone healing, reduce pain, and decrease inflammation. Significant effort has been made to clarify parameters of deposited energy density that will effectively promote positive changes in individual cells while avoiding negative effects. While the bio-stimulatory effect of laser energy is experienced on a cellular level, the energy is applied macroscopically to large volumes of tissue in a non-uniform manner. As energy passes through tissue, part of it is absorbed so that each successive depth of cells is irradiated differently. The Beer-Lambert law is usually used to define this relationship. However, this is inadequate since the dominant form of interaction at wavelengths between 600 nm and 1400 nm is scattering. Thus, as energy enters the tissue, its density decreases rapidly. The presentation would provide the current in vitro and in vivo researches on a new flat top handpiece for biomodulation and its usefulness in medical and dental applications.

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State of the art of photobiomodulation (PBM) in the management of cancer-therapy side effects: Indications and levels of evidence

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Abstract

Objectives. To assess the current and potential indications of photobiomodulation therapy (PBMT) and their level of evidence in the prevention or treatment of side effects related to oncology treatments (radiotherapy, and to a lesser extent chemotherapy and cell transplants hematopoietic strains). Additionally, we aim to report on the current indications (parameters and doses) of PBMT.

Materials and methods. The Embase, Medline/PubMed, Cochrane, EBSCO, Scopus, and LILACS databases were systematically reviewed in order to include and analyze the clinical studies that evaluated photobiomodulation in the prevention or management of burden of side effects related to radiotherapy. The keywords used were "photobiomodulation"; "low level laser therapy"; "acute oral mucositis"; "acute dysphagia"; "acute radiation dermatitis"; "lymphedema"; "xerostomia"; "dysgeusia"; "hyposalivation"; "lockjaw"; "bone necrosis"; "osteoradionecrosis"; "radiation induced fibrosis"; "voice and speech alterations"; "palmar-plantar erythrodysesthesia"; "graft versus host disease"; "peripheral neuropathy"; "chemotherapy induced alopecia". Prospective studies were included, while retrospective cohort studies and non-original articles were excluded from the analysis.

Results. Photobiomodulation with red or infrared spectrum has demonstrated its effectiveness in randomized controlled trials in the prevention and management of certain complications related to radiotherapy, in particular acute mucositis, epitheliitis and upper limb lymphedema. The level of evidence associated with photobiomodulation was heterogeneous, but overall remained moderate. The main limitations were the diversity and the lack of precision of the treatment protocols, which could compromise the efficiency and the reproducibility of the results of the photobiomodulation. For other effects related to chemo/radiation therapy (dysphagia, dysgeusia, osteonecrosis, peripheral neuropathy, alopecia, palmar-plantar erythrodysesthesia) and hematopoietic stem cell transplantation (host graft disease), PBMT suffers from a lack of studies or limited studies causing a weakened level of evidence. However, based on these results, it was possible to establish parameters and doses of safe photobiomodulation practices.

Conclusions. Published data suggest that photobiomodulation could therefore be considered a supportive care on its own, for patients treated with irradiation, chemotherapy, immunotherapy, hormone therapy, or targeted therapies, whether in clinical practice or in therapeutic trials. However, until solid data on its long-term safety are published, the use of photobiomodulation should be considered with caution and within the recommended doses and parameters, particularly when practiced in areas of known or possible tumors. In this case, the patient must be informed of the theoretical benefits and risks of photobiomodulation in order to obtain informed consent before treatment.

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Biological considerations in light therapy

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Abstract

The sun is a broadband light emitter, ranging from 250 nm to more than 4000 nm, exposing us to photons with predominately near-infrared light (NIR) wavelengths. The NIR represents 70% of the total solar spectrum that humans have been exposed to for millions of years. It is the single largest external stimulus to the human body (up to 60 MJ/day).

The human body, under the assumption of natural sunlight, has developed optical mechanisms to gather and localize NIR photons in the most sensitive areas of the body: blood vessels, retina, brain, skin, and even the fetus; providing the primary stimulus during the day to the majority of our cells, and impacting 60% of the cells in an adult body and 100% of the cells in the fetus and young children.

The NIR photons from 650 nm to 1200 nm are responsible for the daylight production of subcellular melatonin, a hormone that serves as a reservoir of extremely powerful antioxidant in each of our healthy cells. This hormone is responsible for helping to enhance the body's ability to deal with changing conditions rapidly and locally throughout the day, combating free radicals, and protecting nuclear and mitochondrial DNA. The reduction of exposure to NIR light in modern societies would appear to be increasing oxidative stress in the human body.

Photobiomodulation therapy could be a valuable tool to combat oxidative stress-induced dysfunctions, help regulate human body cells, and improve several biological functions, including the production of subcellular melatonin, an extremely powerful antioxidant and protector of nuclear and mitochondrial DNA.

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Hemolasertherapy: A pioneering technique that uses a patient with their own stem cells "in loco" to regrow gingiva and bone: A translational in vitro and in vivo study

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Abstract

Background and objectives. The purpose of this presentation was to explore the possibilities for the translational application of photobiomodulation therapy (PBMT) to regenerate gingival tissues and grow interdental papilla using the technique called hemolasertherapy (HLT). This presentation will explore all the potential mechanisms and the role of the laser light, both low-level laser and Er:YAG laser, to achieve, in some clinical situations, the complete regeneration of the papilla and bone.

Materials and methods. The PBMT used a 660-nm diode laser (Laser Duo; MMO, São Carlos, SP, Brazil), applied immediately after bleeding. Parameters used were power output: 100 mW, CW; diameter tip: 5 mm; spot area: 0.19 cm^2; irradiation exposure time per point: 20 s; total of 2 sessions, with a 1-week interval; E: 2 J per point; E: per daily session, 28 J; irradiance per point: 0.52 W/cm^2; fluence per point: 10.4 J/cm^2. Total in two daily sessions: total energy: 56 J; total fluence: 294.75 J/cm, 560 s total time. An in vitro preliminary study was simultaneously carried out to demonstrate what could happen at cellular level in hemotherapy clinical cases associated with PBMT laser application. In recent publication, the authors introduce the Er:YAG laser (Lite Touch, Israel). The parameters were energies in gentle mode (≤0.8 W) in bone defects with excellent clinical results. This presentation will describe the results of 3 papers published about HLT.

Results. The studies demonstrated that the blood clot originated from the bleeding provoked in the gingival area is rich in mesenchymal stem cells. Photobiomodulation enables preservation, viability, and further differentiation, stimulating the return of gingival stem cells, which would support their survival and differentiation in the blood clot, thus favoring interdental papilla regeneration. The association with Er:YAG is promising for decontamination of bone and in cases of peri-implantitis association.

Conclusions. Hemolasertherapy is a new and revolutionary step in tissue regeneration based on PBM of MSCs of the blood itself (autologous), and the use of Er:YAG laser can help in cases of bone defects with excellent clinical results.

Key words: photobiomodulation, stem cells, papilla regeneration, periodontology

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(Online) Laser in esthetic dentistry: Innovation in clinical use based upon scientific evidence

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Abstract

The objective of this presentation is to demonstrate innovative use of lasers in esthetic dentistry. The authors will present a new Er:YAG laser (LiteTouch, Israel) with potential to remove caries, dentin, enamel, cemented ceramic laminates and soft plastic surgery, as well as peri-implantitis treatment. According to Shibli (2018), cleaning/decontamination of dental implant surfaces by means of high- and low-intensity laser therapy using Er:YAG has also been employed. The laser irradiation removes not only the inflammatory soft tissue around the peri-implant pocket but also detoxifies the implant surface without damaging or altering the titanium surface or dental implant morphology, allowing a better stabilization of the blood clot with or without the addition of bone graft materials during guided bone regeneration. Additionally, papers published in the last 20 years show that the wavelengths of erbium lasers coincide with the absorption peak of water and hydroxyapatite, resulting in microexplosions which can remove hard dental tissues. The carious tissues contain a higher amount of water compared to healthy tissues, making a greater interaction between the Er:YAG laser and the organic substrate. This high selective absorption indicates zones of high absorption, thus obtaining selective caries removal. The equipment can irradiate with several different levels of energy (mJ) and frequency (Hz), which are selected by the operator on each clinical indication. In the soft tissues, fast and efficient cutting was observed, such as removal of gingival hyperplasia and gingival contour and tissue decontamination. Another clinical use of the Er:YAG laser is for removal of ceramic restorations, offering an alternative to high-speed burs, promoting a less invasive procedure to the underlying tooth structure. It can be used to efficiently, safely and predictably remove all porcelain laminates and veneers. Currently, with the development of more adequate parameters, the removal of these veneers can be performed in 30–60 s each, depending on the ending on the thickness and the type of ceramic. Normally, it can be performed without the use of anesthesia. In conclusion, the Er:YAG laser is a modern method to improve the quality of dental functional and esthetic procedures.

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Clinical protocols for the use of antimicrobial photodynamic therapy in pediatric dentistry

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Abstract

To present the use of antimicrobial photodynamic therapy in protocols with scientific evidence for the treatment of halitosis, caries lesions and hypomineralization of molars and incisors, emphasizing the use in children and young people.

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Pain perception due to laser protocols in dentistry

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Abstract

Objectives. The purpose of this research is to assess the analgesic efficiency of photobiomodulation (PBM) in pain reduction in patients during dental therapies in orthodontics, implantology and periodontics.

Materials and methods. We performed different randomized controlled trials (RCTs) in which patients were included and allocated to an experimental group (1. orthodontic treatments, as self-ligating appliances, clear aligners, rapid palatal expansion, bands on upper molars, and PBM; 2. single implant placement and PBM; 3. comparison between Dye-free PDT and LANAP in non-surgical periodontal treatment) and a control group (orthodontics, implants and perio only) at random. We used different devices, laser and LED. Patients referred the pain they felt using a numerical scale rate (NRS), ranging from 0 to 10, with specific intervals of time: 6 h, 12 h, 24 h and from days 2 to 7. The Wilcoxon–Mann–Whitney test was used to evaluate differences in NRS values between the two groups.

Results. The pain experienced at each time interval and the maximum score of pain were significantly lower in the experimental group ($p < 0.05$) and decreased faster in the experimental group, with a score test near to 0 after 2/3 days.

Conclusions. Photobiomodulation is efficient in reducing the pain intensity and duration in orthodontics, in single implant placement and in non-surgical periodontal protocols.

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Photobiomodulation for the treatment of cancer therapy side effects

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Authors information

James Carroll has been working on photobiomodulation for 30 years (since 1987). He is a recognized authority on photobiomodulation dose, dose rate effects, and the measurement and reporting of parameters. He has written or co-authored 18 published academic papers and three books on laser photobiomodulation. His most recent appointments include: Biomedical Optics Society conference chair (2009–to-date), Fellow of The Royal Society of Medicine (2009–to-date), Editorial Board of Photomedicine and Laser Surgery (2008–2015), and served on the World Association for Laser Therapy (2000–2004) and the North American Association for Laser Therapy (2002–2006). James presented Photobiomodulation to the United Nations Global Health Impact Forum, and is a recent recipient of the 2020 WALT (World Association for Laser Therapy) Presidential Commendation for Service and Leadership in Photobiomodulation.

Abstract

A leading area of academic research for photobiomodulation (PBM) in dentistry is the treatment of cancer therapy side effects. For oral mucositis, there are 56 controlled clinical trials and 28 systematic reviews published alone for this one application. Photobiomodulation is a recommended treatment in the UK by The National Institute for Health and Care Excellence (NICE), the Multinational Association for Supportive Care in Cancer (MASCC), the Children's Oncology Group (COG), and the American Academy of Pediatric Dentistry.

There is also emerging evidence showing that this same technique works for improving hyposalivation/xerostomia, dysgeusia, dysphagia, radiation dermatitis, lymphedema, and graft versus host disease (GVHD).

A common and reasonable question frequently asked is what effect it has on cancer cells/tumors. Five longterm studies show that PBM has no adverse effects on recurrence, disease-free, progression-free, or overall survival.

This brief introduction will summarize the evidence of efficacy, safety and cost benefits of PBM in the treatment and prevention of cancer therapy side effects.

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(Workshop) Introduction to photobiomodulation: Applications and mechanisms

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Abstract

Photobiomodulation (PBM) involves the use of low-intensity light to treat acute traumatic injuries or chronic degenerative non-healing conditions, with the goal of reducing inflammation and pain while enhancing tissue repair. Over 1000 randomized controlled clinical trials have been published, and PBM is recommended in many clinical care guidelines.

In dentistry, PBM is often used postoperatively as an alternative to analgesics, helping to alleviate pain and trismus in temporomandibular joint disorders and promoting neurosensory recovery after iatrogenic injury to the inferior alveolar nerve. Additionally, PBM can ameliorate burning mouth syndrome and other neuropathic conditions such as trigeminal neuralgia, postherpetic neuralgia and shingles. It is also effective in treating minor lesions like HSV-1 (cold sores), aphthous ulcers, improving osseointegration of implants, and expediting tooth movement in orthodontic patients.

A leading area of academic research for PBM in dentistry is the treatment of cancer therapy side effects, specifically oral mucositis. There are 60 controlled clinical trials for this application alone, and it is a recommended treatment in the UK by The National Institute for Health and Care Excellence (NICE), the Multinational Association for Supportive Care in Cancer (MASCC), and the Children's Oncology Group (COG).

Beyond the oral cavity, PBM is widely used for musculoskeletal pain (e.g., back pain, neck pain, osteoarthritis, tendinopathies), non-healing wounds such as venous ulcers, pressure sores, and diabetic foot ulcers. There is also emerging research on PBM's potential for treating traumatic injuries and degenerative conditions of the brain, eye and spinal cord.

Systematic reviews published in prominent journals such as The Lancet, JAMA and the British Medical Journal have concluded that PBM is safe and more effective than the standard of care.

But how can one therapy treat such a diverse range of conditions? The key lies in their shared feature: oxidative stress. Photobiomodulation is known to improve mitochondrial function, leading to increased adenosine triphosphate (ATP) production and reduced oxidative stress. The downstream effects of these changes result in decreased inflammation, reduced pain and enhanced healing.

Now, with the advent of whole-body PBM, there are opportunities for PBM to be used not only to reduce pain and promote repair, but also to improve strength, endurance and recovery after exercise. Improved sleep, vitality, reduced pain, and a general sense of well-being are common feedback. Reduced pain, improved function and enhanced psychological benefits have been confirmed in randomized controlled clinical trials involving fibromyalgia patients.

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(Online) Photobiomodulation: Therapeutic targets and dose response

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Abstract

Photobiomodulation (PBM) involves the use of low-intensity light to treat acute traumatic injuries or chronic degenerative non-healing conditions, with the goal of reducing inflammation and pain while enhancing tissue repair. Over 1000 randomized controlled clinical trials have been published, and PBM is recommended in many clinical care guidelines.

Most research studies apply light to the pathology; however, some indirect PBM targets should be considered, including treatment of the lymphatic system, sensory nervous system and myofascial trigger points. There are systemic effects, changes in blood flow, and even benefits from treating healthy tissue to add to your treatment plan.

There is a dose-response to PBM. Not enough light yields no effect, a bit more light results in positive effects on inflammation and healing, too much light and the benefits are lost, and in extreme cases, it is possible to reduce the rate of healing.

This video introduction is designed to raise awareness of these techniques and encourage thinking beyond just aiming the light at the pathology.

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Erbium laser irradiation as a pre-treatment surface between zirconia and resin cement

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Abstract

In oral rehabilitation, dental ceramics are used to make dental crowns, thus providing natural esthetic characteristics to restore teeth. The Yttria-stabilized tetragonal zirconia polycrystal (Y-TZP) has demonstrated excellent resistance to bending and fracture, flexural strength, chemical stability, biocompatibility and optical properties, having become a good choice for crowns, fixed partial dentures and implant abutments. Studies have suggested the application of lasers such as CO_2, Er:YAG and Nd:YAG before or after sinterization to roughen the zirconia surface in order to improve the adhesion of the tooth structures.

Our studies found that the Er,Cr:YSGG laser irradiation at pre-sintered ZrO_2 improved shear bond strength (uSBS) values to groups that received ceramic primer. the Er,Cr:YSGG laser irradiation at pre-sintered ZrO_2 followed by ceramic primer achieved uSBS values similar to tribochemical silica-coating treatment, and surface roughness data showed a strong positive Pearson's correlation ($p < 0.01$) with $r = 0.9$ and 95% confidence interval (CI) of 0.84–0.94. The surface roughness is an important parameter and could increase bonding strength values. Control group (no laser) showed statistically significant differences from irradiated groups. The application of the Er,Cr:YSGG ($\lambda = 2780$ nm) laser irradiation of ZrO_2 as a surface treatment has potential to be a promising field of study.

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(Online) Cavity preparation with erbium laser and its potential to prevent secondary caries lesions

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Abstract

Patients with high caries risk usually require dental restoration replacement because of secondary caries lesions. The preventive characteristics of glass-ionomer-based restorative materials are related to fluoride release and its capacity to inhibit secondary caries lesions (Poppof et al., 2000).

Erbium wavelength coincides with the water absorption spectrum and results in thermal energy and surface temperature rise. After irradiation with laser, chemical and structural alterations in enamel, such as decreased carbonates, fusion and re-crystallization of hydroxyapatite crystals, make enamel more resistant to acid attacks (Farhadian et al., 2017; Jorge et al., 2015).

Erbium lasers may promote chemical and/or morphological alterations on dentin and enamel surface after cavity preparation. Our studies found that Er:YAG laser irradiation removed the smear layer and the dentin surface presented opened dentin tubules with no evidence of thermal damage such as cracking or carbonization (Leonetti et al., 2012; Leonetti et al., 2011).

Some in vitro and in situ studies were able to demonstrate the potential of erbium lasers to increase enamel acid resistance (Jorge et al., 2015; Perito et al., 2009). There was less development of caries lesion around laser prepared cavities than around the drill groups, regardless of fluoride presence in the restorative material (Jorge et al., 2015; Perito et al., 2009).

The use of the Er,Cr:YSGG laser with pulse frequency of 30 Hz and power of 0.50 W seems to be a safe parameter to improve enamel erosive challenge (Oliveira et al., 2017). There are positive indications that demonstrate the potential of erbium lasers to increase enamel acid resistance.

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(Workshop for Hygienists) Periodontitis and peri-implantitis: Biologically oriented minimally invasive treatment

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Ivan Ćatović graduated from the University of Rijeka (Croatia) School of Dental Medicine in 2015. In 2016, at the University Guglielmo Marconi in Rome (Italy), he became a Master of Science in Oral Implantology and in 2020 he has finished his postgraduate program in Periodontology at the University of Zagreb (Croatia) School of Dental Medicine, where his focus was on regenerative periodontal therapy around teeth and implants. Currently, he is working in his private practice in Croatia and Italy in the field of periodontology, implantology and prosthetics.

Abstract

A one-day theoretical and practical introductory course with the Vector® principle for minimally invasive method of removing supra- and subgingival deposits around teeth and implants. In the theoretical part, the basic principles of non-surgical and surgical principles will be explained:

- periodontal therapy: diagnostics, therapy planning, treatment techniques;
- patients with periodontitis and peri-implantitis with the help of Vector Paro and Vector;
- scaler of ultrasonic extensions and monitoring and supportive periodontal therapy in daily clinical work.

In the practical part, participants will have the opportunity to try the VectorParo Pro ultrasound system on models and apply the principles and treatment techniques described in the theoretical part.

Theoretical part:

- diagnosis of periodontitis and peri-implantitis;
- therapy plan considering the degree and class of periodontitis;
- treatment techniques for shallow, moderately deep and deep pockets around teeth and implants;
- therapy of periodontitis and peri-implantitis with the help of Vector Paro and Vector Scaler of ultrasound extensions;
- re-evaluation and protocols for supportive periodontal therapy.

Practical part:

- familiarization with the Vector Paro Pro ultrasound system and its mode of operation;
- practical application of the system on models with the techniques described in the theoretical part.

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Photo-eradication of microorganisms with pulsed blue light: Treatment of resistant bacteria and viruses

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PhD, FACSM, Full Professor, Director of Photomedicine Research Laboratory, College of Health and Human Services, San Diego State University, USA (Dean). He was Distinguished Professor and Dean of the College of Health Sciences, University of Wisconsin-Milwaukee for 5 years and served more than 6 years as Professor and Dean, School of Health Professions at the New York Institute of Technology. Moreover, he held professorial positions at the University of Kansas, the University of Miami, and the University of Texas Health Science Center at San Antonio before his deanships.

Abstract

Emerging research data continue to strengthen the view that blue light in the range of 405–470-nm wavelength is antimicrobial against several bacteria. In recent studies, we showed that pulsed blue light (PBL) is not just a more potent antimicrobial than conventional blue light, but also a non-chemical and non-pharmaceutical antiviral against coronaviruses. This presentation reviews our recent studies and those of others, and summarizes our findings which show that PBL, when incorporated into dental practice, could ameliorate oral bacterial and viral infections. The paper highlights the antimicrobial value of certain light-based dental technologies and presents recent data from our ongoing studies which show that PBL-based LED light fixtures, designed for environmental sanitation, are antiviral and antibacterial against some of the deadliest bacteria and viruses. These recent findings indicate that it is possible to develop and deploy commercial cost-effective light fixtures as environmental decontaminants that can inactivate viruses and other microorganisms safely, not just in hospitals and clinics, but in homes, offices, ambulances, and other modes of transportation. The implications of these findings for disease epidemics and pandemics will be discussed.

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Philosophy and successful application of non-surgical periodontal treatment

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He has been a board member of the Turkish Society of Periodontology since 2014, where he still serves as the general secretary. He has taken the role as the Ambassador for the EuroPerio 9 and EuroPerio 10. He also serves as the EFP delegate of Turkish Society of Periodontology. He is a member of the Scientific Affairs Committee of the EFP.

Abstract

Non-surgical periodontal treatment, also known as phase I therapy or initial periodontal therapy is one of the most important steps in the systemical structure of periodontal treatment approach. The philosophy behind this approach gives its potential for success in terms of resolution of periodontal inflammation and healthy periodontal tissues for longer periods. With increased knowledge on periodontal disease pathogenesis and technological advances in our tools and devices, we obtain better treatment outcomes with non-surgical treatment alone.

In this lecture, we will discuss, based on clinical cases, how to apply non-surgical periodontal treatment in clinical practice and how to be successful every time. The advances in our tools and devices that are used during the treatment will be overviewed.

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(Workshop) Periodontology: Successful non-surgical periodontal treatment

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Frontier in femtosecond laser enamel ablation: A miniaturized robotic system

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Dr. Ambrose Chan is a general dental practitioner who has incorporated photonic and laser technologies in dentistry for over 35 years. His clinical competency has been recognized nationally by his conferral as a Fellow of the Royal Australasian College of Dental Surgeons. Not only has his expertise benefited his own patients, but he has made solid contributions towards the development of Dentistry itself, taking on an integral role as a Representative on Laser for the Australian Dental Association and Committee member of the "Standards Australia on Laser Applications and Regulations". In scientific front, he was conferred the highest university degree of PhD in Medicine, University of Sydney, expanding the boundaries of knowledge in photobiomodulation therapy with its insight into effective photon delivery. Notably, he was awarded MScD from the University of Sydney, with a master thesis on "Laser Dentistry" resulting in a paper in one of the two top dental journals and an Editorial. He also reputably won the prestige prize of "The Best Scientific Research Award" (2010) at the World Federation for Laser Dentistry Congress. Currently, he serves as an Honorary Research Fellow at the Brain and Mind Centre, University of Sydney. Eminently, he also serves as the member of the Editorial Board for the Journal of Lasers in Medical Science. In addition to operating an established dental practice and research, he also teaches and lectures at both national and international levels. As the Director for the Asian Pacific Division of the World Federation for Laser Dentistry, he has been essential in organizing dental laser conferences and developing and teaching curriculum for university-based dental laser training in the Asia-Pacific region. Through these involvements and in recognition of his significant contributions to Laser Dentistry in the Asian Pacific, he was conferred as a Fellow by the International College of Dentists and was appointed as the Honorary Assistant Professor at the Faculty of Dentistry, University of Hong Kong.

Abstract

Almost a century ago, rotary drill had been accepted as the benchmark for the hard tissue preparation and caries removal. Unfortunately, the potential adverse effects such as thermal pulpal injury and crack formation are inevitable.

Mid-infared (Er:YAG, Er,Cr:YSGG and 9.3; 9.6 μm CO_2) lasers with pulse duration operate in the micro-pulse regime. They can ablate dental tissues and remove caries with increased patient comfort and minimal invasiveness without the noise and vibration, and have gained their publicities especially in treating anxious patients. However, due to their limitations, such as inefficient, relatively slow, uncontrollable, not precise, absorption-dependent ablation with long shockwave thermal side effects, investigations of the femtosecond (fs)-laser regime have been conducted.

Femtosecond laser operates with pulse duration (<1 ps) shorter than the tissue thermal relaxation time and delivers a chain of high intensity photon pluses (>1014 W/cm^2), of mJ energy, sufficient to induce localized non-linear absorption (chromophores independent), which can ionize and eject tissues and materials in an electrostatic manner, without thermal side effects and induced pain.

A benchmark Australian multicenter study on fs-laser enamel ablation, published in Australian Dental Journal 2003, ran by 3 Australian universities: The Australian National University, Swinburne University and the Macquarie University, had demonstrated its highly precise and effective ablation capabilities, with minimal thermal effects and many other potential benefits in dental tissue machining.

Over the last decades, with the technological advancement in high power, ultra-fast and ultra-short pulsed fs lasers and robotic assisted delivery systems, this technology has become more affordable and attractive for developing clinical applications in dentistry.

In a 20-min lecture, I will highlight the breakthrough in the first fs-laser research in Australia; technological advancement in the past decades; the advantages, limitations and potential of fs-laser robotic enamel ablation, and finish with a take-home message.

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(Online) An adjunctive use of photonic dentistry in cariology: Early detection and therapy

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Dr. Ambrose Chan is a general dental practitioner who has incorporated photonic and laser technologies in dentistry for over 35 years. His clinical competency has been recognized nationally by his conferral as a Fellow of the Royal Australasian College of Dental Surgeons. Not only has his expertise benefited his own patients, but he has made solid contributions towards the development of Dentistry itself, taking on an integral role as a Representative on Laser for the Australian Dental Association and Committee member of the "Standards Australia on Laser Applications and Regulations". In scientific front, he was conferred the highest university degree of PhD in Medicine, University of Sydney, expanding the boundaries of knowledge in photobiomodulation therapy with its insight into effective photon delivery. Notably, he was awarded MScD from the University of Sydney, with a master thesis on "Laser Dentistry" resulting in a paper in one of the two top dental journals and an Editorial. He also reputably won the prestige prize of "The Best Scientific Research Award" (2010) at the World Federation for Laser Dentistry Congress. Currently, he serves as an Honorary Research Fellow at the Brain and Mind Centre, University of Sydney. Eminently, he also serves as the member of the Editorial Board for the Journal of Lasers in Medical Science. In addition to operating an established dental practice and research, he also teaches and lectures at both national and international levels. As the Director for the Asian Pacific Division of the World Federation for Laser Dentistry, he has been essential in organizing dental laser conferences and developing and teaching curriculum for university-based dental laser training in the Asia-Pacific region. Through these involvements and in recognition of his significant contributions to Laser Dentistry in the Asian Pacific, he was conferred as a Fellow by the International College of Dentists and was appointed as the Honorary Assistant Professor, at the Faculty of Dentistry, University of Hong Kong.

Abstract

Despite considerable advances in dentistry, dental caries remains one of the most common and unsolved human infectious diseases. Around 90% of young population in the United States has dental caries, while out of all dentate adults, almost 94% have evidence of coronal caries. It was forecasted that such occurrence is the driver that propels the growing demand for dental services. There is an urge in demand of adjunctive use of photonic (laser and light) dentistry in a multidisciplinary, minimally invasive and preventive approach that would encourage regular patient attendance to allow for patient education, early caries detection and intervention. Researchers in 1940s demonstrated that exposure to photons from the sunlight provided a mean of dental caries prevention. A survey of 12–14 years old boys in rural and semirural areas of the United States reported that a 30% increase in the annual exposure to sunshine correlated with a 40% reduction in the incidence of dental caries. Today, photon technology underpins a wide range of adjunctive applications in daily dental practice from digital-light-processing 3D scanning, fluorescent-guided caries and oral cancer early detection, to photo-ablation, photobiomodulation, caries prevention, photo-activated disinfection and photo-acupuncture. The aim of this lecture is to present the "ABCD of light in Cariology", an adjunctive use of photonic (laser and light) dentistry in a multidisciplinary, minimally-invasive and preventive approach that would encourage regular patient attendance and allow for patient education, early caries detection and intervention.

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The role of natural and chemical-mediated photodynamic therapy in the management of oral infection

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Abstract

The main goal of dental treatment is to eliminate or at least decrease microbial population. Among different antibacterial laser procedures, antimicrobial photodynamic therapy (aPDT) has gained special attention due to its minimally invasive manner and safety. This technique involves light of a specific wavelength to activate a photosensitizer in the presence of oxygen in order to produce cytotoxic products, which leads to cell death. Various types of chemical and natural photosensitizers, such as toluidine blue, methylene blue, indocyanine green, phycocyanin, curcumin are used. This new approach of using aPDT with natural photosensitizers with potential biological activities can be beneficial as an adjunct to conventional therapy. The aim of this lecture is to assess the anti-bacterial efficacy of aPDT against oral bacteria.

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State of the art and technological challenges for translational medicine: Minimally invasive energy-based devices

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MD PhD, Professor, President of the Brazilian Academy Society for Laser and Biophotonics in Medicine, works for the Ministry of Health, Brasil. Clinical Researcher Professor, Professor of Laser's Bio-Medicine. Recently elected as the Board Director of the American Society for Laser in Medicine and Surgery; Professor of the Thoracic Cardiovascular Department at INCOR/FMUSP. She was responsible for developing and implementing two post-graduate courses, applying lasers in the field of bioengineering and biomedical engineering in different states of Brazil. She ground 3 post-graduate courses in the biophotonics field. Presently, she is a Senior Professor of Medicine for Under-Graduate and Postgraduate descents, and in Biophotonics Applied to Health Science at Nove de Julho University, São Paulo.

Abstract

The studies conducted by our group are focused on several illnesses and disorders among different medical specialties and, in complex cases, applying laser therapy (LT) as the last resort to improve patients' conditions. Surgical laser (SL) has been employed with effective results for over 5 decades to assist in neurosurgery, gynecology, and pulmo-cardiovascular, especially major surgical procedures. Photobiomodulation therapy (PBMT) is a residual effect of SL, which can lead to anti-inflammatory/antiedematous effects, stimulating angiogenesis and analgesic response, and improving healing processes.

Major surgeries still pose a challenge to both patients and physicians. Photobiomodulation therapy, also known as low-level laser therapy (LLLT) or simply laser therapy, can aid in the reduction of postoperative morbidity in major surgeries, such as sternotomy, laminectomy, orthopedics, gynecology, and gastrointestinal procedures (i.e., bariatric surgery).

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(Online) Lasers in dentistry: Simple procedures, excellent care

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Prof. Donald J. Coluzzi, DDS, a 1970 graduate of the USC School of Dentistry, is a Clinical Professor in the Department of Preventive and Restorative Dental Sciences at the University of California San Francisco School of Dentistry. He retired from general practice after 35 years and is a life member of both the California Dental Association and the American Dental Association. He has served as a past president of the Academy of Laser Dentistry, received its Leon Goldman Award for Clinical Excellence and is a past editor of the Journal of Laser Dentistry. He has used dental lasers since early 1991. He is a Fellow of the American College of Dentists, the International College of Dentists, and is a member of Omicron Kappa Upsilon, the national dental honor society. He serves as a reviewer for several journals, and is a founding associate of Laser Education International. He recently received the outstanding faculty member award from the American College of Dentists. Dr. Coluzzi has presented about lasers worldwide, co-authored 3 text books, and published several peer-reviewed articles and chapters in dental books.

Abstract

This presentation will summarize how dental lasers can be utilized for several common procedures. Numerous clinical cases, including minor oral surgery, soft tissue management, caries removal, osseous procedures, and periodontal/peri-implant therapy, will be shown along with the different available wavelengths employed. The benefits will clearly demonstrate how excellent dental care can be provided with lasers as part of your armamentarium.

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Photobiomodulation and oral mucositis: New protocols

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Abstract

Oral mucositis (OM) is a debilitating complication of chemotherapeutic drug infusion (CT) and radiotherapy (RT). A few days after such treatment has commenced, the patient complains of soreness, and the oral tissues appear red and smooth. Rapidly, the integrity of the mucosa breaks down and ulceration occurs to affect the buccal mucosa, ventral lingual mucosa, soft palate, and the inner aspects of the lips and the floor of the mouth. Intense pain is associated with OM and oral functions are impaired, especially speech and feeding.

In recent years, the influence of nutrition on the health and growth of children has become increasingly important and the relevance of nutrition is even greater for children who are facing cancer. There is a large body of evidence supporting the efficacy of photobiomodulation (PBM) when used for the prevention and/or treatment of oral mucositis in patients undergoing radiotherapy for head and neck cancer, or high-dose chemotherapy regimens. The PBM parameters are usually within the red and NIR wavelength range of 600–1000 nm, and the therapeutic effect is typically dictated by the energy density measured in joules (J) per cm^2.

In this presentation, new protocols of PBM therapy are suggested in order to optimize the clinical effects and to give a full and proper understanding of the ability of reducing side-effects of CT and/or RT.

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(Online) Laser-activated irrigation techniques in the root canal therapy

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Member of the Romanian Society for Microscope Dentistry (2012–present); Member of the Romanian Society for Laser Dentistry (2016–present), MSc Universita Cattolica del Sacro Cuore, Rome (September 2020), Laser Dentistry Master, Master in Laser Dentistry – LA&HA Institute, Ljubliana, Slovenia. Invited Speaker at the AEEDC DUBAI 9–11 February 2020, Invited Speaker at the 3rd Congress of Polish Society for Laser Dentistry, PTSL Cracow, 18–19 October 2019, Invited Speaker at the 2nd International Congress of Lasers in Dentistry, 5–7 September 2018, Constanta, Romania, Invited Speaker at the 7th Edition of the International Conference on Lasers in Medicine, 13–15 July 2017, Timisoara, Romania, Invited Lecturer at the 7th Symposium Lasers in Medicine and Surgery, Kranjska Gora, Slovenia, May 2017.

Abstract

Root canal treatments consist of mechanical instrumentation followed by irrigation to facilitate removal of bacteria, debris and therapeutic materials such as gutta-percha, sealer and medication from root canals. While the effectiveness of irrigation relies on both, the ability of irrigant to dissolve the tissue, and the mechanical flushing action to remove material from the canal, it has been suggested that the flushing action is more important than the ability to dissolve the tissue, especially since most of the dentine is an inorganic matter that cannot be dissolved by sodium hypochlorite (NaOCl) solution.

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Neonatal and infant tongue-tie release: Diagnosis and treatment

Robert Convissar (USA)

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Authors information

Dr. Convissar is a pioneer in the field of laser dentistry. He has over 33 years of experience with CO_2, Nd:YAG, erbium and diode wavelengths. The author of 16 papers and 6 textbooks on laser dentistry, he has presented close to 400 seminars on 5 continents from London to Florence to Dubai to Tokyo to Sydney to Bahrain to Saudi Arabia and everywhere in between. He practices cosmetic, restorative and laser dentistry in New York City. His textbook, *Principles and Practice of Laser Dentistry* has been the No. 1 selling laser dentistry textbook in the world for over a decade – translated into Chinese, Russian, Spanish, and Portuguese, with more on the way. He is the only dentist in the world that has achieved Diplomate status from the American Board of Laser Surgery, Fellowship in the American Society of Laser Medicine and Surgery, Mastership in the Academy of Laser Dentistry as well as Fellowship in the Academy of General Dentistry. His PEEL Technique for laser infant tongue-tie and lip release is so unique that it has been granted trademark status in the USA, the UK and Canada, with other countries pending. He has taught thousands of dentists, physicians, nurse practitioners, and other health care professionals this unique technique, in addition to performing thousands of such procedures. Dr. Convissar also teaches oral cancer diagnosis and biopsy techniques – both with lasers and with conventional instruments.

Abstract

Introducing the PEEL Technique® – A New Paradigm in Pediatric Tongue Tie Treatment. This course includes a certified lactation consultant, a critically important part of the tongue tie release team. In this combination lecture and hands-on course, attendees will be introduced to the concept of laser frenectomies, an increasingly popular method by which dentists and physicians can treat tongue and lip ties in their patients.

Five percent or more of the babies born in the United States have such tight tongue-ties and frenum pulls that they cannot successfully latch onto their mother's nipple and breastfeed. For the baby, serious consequences include loss of weight and the label of "failure to thrive". For the mother, this results in sore and cracked nipples, mastitis, painful engorgement and post-partum depression due to an inability to nurse her baby. This has classically been treated by a physician taking a scalpel or a pair of scissors to the newborn's mouth and cutting the attachment. The treatment of choice, however, is for a dentist to use laser technology to painlessly and bloodlessly remove the attachment, allowing the infant to immediately nurse. Though many practitioners perform tongue-tie release, few are trained in the PEEL Technique, which ensures 4 movements the tongue to nurse successfully: peristalsis, elevation, extension, and lateralization.

This participation course will teach the medical and dental team how to:

- accumulate all of the required data via history intake forms;
- perform a clinical examination to arrive at the correct diagnosis;
- evaluate when this procedure should be done;
- perform the procedure using laser technology;
- network with lactation consultants, pediatricians, neonatologists, and the rest of the medical team;
- grow your practice of neonatal dentistry.

Candidates who successfully complete this course will receive a Certificate in Pediatric Tongue Tie and Lip Tie Diagnosis and Treatment recognized by the American Board of Laser Surgery, the only Medical Certifying Board in the world dedicated to lasers and light energy in medicine and dentistry.

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Photothermal effects of high-energy photobiomodulation therapies

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Doctoral candidate at the University of Birmingham, Director of Dental Laser Training Academy Ltd., President of Pandora Dental Training and Guidance Ltd. Dr. Mark Cronshaw trained at Guy's Hospital in London. He graduated in 1981 with a degree in biomedical sciences before completing his dental studies in 1984. He has used lasers in his daily clinical practice since 2005, and he maintains a busy private general practice in Cowes, UK. He was appointed a Professor A.C. at the University of Genoa in 2014–2020 where he taught the Advanced Master's Degree course in oral laser applications; he lectures on oral laser applications worldwide. In 2012 he was awarded the prestigious Fellowship award of the International Academy of Dento-Facial Esthetics. Dr. Cronshaw is on the editorial peer review panel of the journals Lasers in Medical Science and Photochemistry and Photobiology and is also a board member of Laser Education International. His clinical interests are phototherapy, esthetic dentistry, holistic dental care, minimally invasive dentistry as well as the application of laser therapy as an adjunct to tissue regeneration and pain management in periodontics and surgery. In collaboration with his co-Director Professor Steven Parker, he runs a highly active laser training academy offering a variety of dedicated oral laser training programs. Dr. Cronshaw has written over 20 peer-reviewed scientific papers on the clinical applications of lasers in dentistry and he is actively involved in continued research. Dr. Cronshaw is a contributory author who provided a chapter on orthodontics in the best-selling textbook *Lasers in Dentistry: Current Concepts*, editors Steven Parker and Don Coluzzi, published by Springer in October 2017. Dr. Cronshaw is actively involved in clinical research into laser tissue interaction in regards to clinical phototherapy and is currently studying for a doctorate at Birmingham University. As a researcher and active clinician, Dr. Cronshaw has studied the literature on the application of photobiomodulation therapies for many clinical applications including sports physiotherapy, CNS disorders, peripheral neuropathic syndromes, and the management of failed wound healing. Most recently, he presented to the World Federation of Laser Dentistry on aspects of dosimetry in photobiomodulation therapies. His current research involves transnational collaboration with groups involved in oncology in France and Poland. During the recent COVID-19 crisis he founded a UK national think tank Pandora Dental Training and Guidance Ltd. This has been influential in formulating a practical response to the challenges in general dental practice to the disruption caused by COVID-19. In recognition of his work, he was given a UK National award earlier this year.

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Abstract

The aim of the study was to investigate photothermal aspects of photobiomodulation therapies (PBMT) in vitro, to assist in the development of safe clinical parameters with respect to higher power devices and progressively larger surface applicators. Laser wavelengths in the range of 650–1064 nm were investigated using a thermal camera. Measurements of surface and sub-surface temperature variations of standardized lean porcine muscle tissue samples were recorded for a series of calibrated experiments. A thermal comparison was made between flat top and Gaussian beam spatial distribution devices. Outcome data were subject to a statistical analysis applying analysis of variance (ANOVA). Results acquired at the chosen parameters of irradiance demonstrated that the 980-nm wavelength was associated with the highest thermal rise, which decreased with other wavelengths in the order 980 > 1064 ≈ 650 >>> 810 nm. All wavelengths assessed were associated with a significant thermal rise, and with the exception of 810 nm, all exceeded a threshold of a 6 rise within the prescribed parameters. Optical scanning by movement of the applied source over an area was found to offer a means to reduce the increase in surface temperature. Notable thermal rise was associated with progressively larger optical spot applicators employing a Gaussian beam at an equivalent average irradiance up to a depth of 2 cm. Recommendations are made to assist future clinical investigations within the limits of an in vitro study.

(Online) Photobiomodulation. From the laboratory to the clinic: Current concepts

Mark Cronshaw (UK)[1,2]

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Doctoral candidate at the University of Birmingham, Director of Dental Laser Training Academy Ltd, President of Pandora Dental Training and Guidance Ltd. Dr. Mark Cronshaw trained at Guy's Hospital in London. He graduated in 1981 with a degree in biomedical sciences before completing his dental studies in 1984. He has used lasers in his daily clinical practice since 2005, and he maintains a busy private general practice in Cowes, UK. He was appointed a Professor a.c. at the University of Genoa in 2014–2020 where he taught the Advanced Master's Degree course in oral laser applications; he lectures on oral laser applications worldwide. In 2012 he was awarded the prestigious Fellowship award of the International Academy of Dento-Facial Esthetics. Dr. Cronshaw is on the editorial peer review panel of the journals Lasers in Medical Science and Photochemistry and Photobiology and is also a board member of Laser Education International. His clinical interests are phototherapy, esthetic dentistry, holistic dental care, minimally invasive dentistry as well as the application of laser therapy as an adjunct to tissue regeneration and pain management in periodontics and surgery. In collaboration with his co-Director Professor Steven Parker, he runs a highly active laser training academy offering a variety of dedicated oral laser training programs. Dr. Cronshaw has written over 20 peer-reviewed scientific papers on the clinical applications of lasers in dentistry and he is actively involved in continued research. Dr. Cronshaw is a contributory author who provided a chapter on orthodontics in the best-selling textbook *Lasers in Dentistry: Current Concepts* editors Steven Parker and Don Coluzzi, published by Springer in October 2017. Dr. Cronshaw is actively involved in clinical research into laser tissue interaction in regards to clinical phototherapy and is currently studying for a doctorate at Birmingham University. As a researcher and active clinician, Dr. Cronshaw has studied the literature on the application of photobiomodulation therapies for many clinical applications including sports physiotherapy, CNS disorders, peripheral neuropathic syndromes, and the management of failed wound healing. Most recently, he presented to the World Federation of Laser Dentistry on aspects of dosimetry in photobiomodulation therapies. His current research involves transnational collaboration with groups involved in oncology in France and Poland. During the recent COVID-19 crisis he founded a UK national think tank Pandora Dental Training and Guidance Ltd. This has been influential in formulating a practical response to the challenges in general dental practice to the disruption caused by COVID-19. In recognition of his work, he was given a UK National award earlier this year.

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Abstract

Photobiomodulation (PBM) offers a great opportunity to transform every aspect of clinical care in dentistry. The mitigation of pain and inflammation as well as the amelioration and prevention of tissue swelling is a core treatment outcome target for many clinical interventions. Furthermore, the ability to promote excellent quality healing with an increase in matrix volume is a key ambition of many regenerative treatments, such as osseous and soft tissue grafting, as well as therapies coupled with growth factors, such as enamel matrix derivative and autogenous blood extracts such as PRF. The potential synergy between approaches offers many interesting possibilities to enhance clinical outcomes. An ageing population combined with multiple medical pathologies represents a major clinical challenge and the potential added benefits of integrating PBM offer a new integrated approach to tissue management. In this lecture, we discuss a philosophy of care which combines the current and emerging evidence base in PBM with the daily challenge to optimize the outcome of our interventions whilst minimizing trauma and enhancing the patient journey.

(Online) Primary prevention of OSCC: An update

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Abstract

Oral squamous cell carcinoma (OSCC) is a primary problem for both clinicians and patients with a high mortality rate due to a relevant diagnostic delay. This datum is in great contrast with the wide and acquired knowledge concerning the main risk factors associated to this pathology; the widest diffusion of these issues should be pursued to reduce efficiently the poor prognosis of the disease. First, the tobacco assumption, in its various ways, including the more recent e-cigs or heat not burn devices. Secondly, the abuse of alcohol often associated to tobacco in the so-called deadly combination. These elements account for over 80% of all oral cancer predisposal factors. Great interest should also be dedicated to: human papillomavirus (HPV) infections, UV light exposure, immunosuppression, ageing, etc. Nowadays, to enhance the early diagnosis of oral cancer, great relevance is given to the oral clinical examination, and more recently, to the oral self-examination. Both topics register an increasing interest in the OSCC literature, showing that they are the new targets in the primary prevention of oral cancer. The main aim for any educational program both of under or post-graduated level is to diffuse at maximum the application of these new methods in primary prevention of oral cancer, hoping to raise the poor epidemiological data that still characterize the outcomes of patients.

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Is there photobiomodulation outside the therapeutic window?

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Abstract

Photobiomodulation (PBM) is the application of low dosages of light energy to evoke a response in the irradiated tissues and promote different effects as: tissue healing and cell regeneration, inflammation reduction, neovascularization, and pain reduction. The majority of clinical applications of the PBM described in the literature support the modulative effects of the red and near-infrared (NIR) wavelengths, included in the 600–1200 nm range that, for this reason, is also known as the "therapeutic window". However, there is an increasing interest among the authors concerning the possible therapeutic effects of the wavelengths in the visible blue (400–470/480 nm) and green (495–570 nm), with the first involved in the reduction of superficial inflammation and wound healing, while the latter seeming to reduce cellulite appearance and swelling.

Further interest in the application of these new wavelengths is the increasing body of evidence about the antimicrobial effects, especially of the blue light, probably due to the activation of endogenous photosensitizer, in particular porphyrins, that are supposed to induce specific bactericidal effects.

The growing interest in the clinical applications of the PBM requires a deep and clear knowledge of the biological mechanisms of action of the therapeutic lights that are induced directly by the absorption of the light, and indirectly by many downstream processes that promote the beneficial effects largely described in the literature. Nevertheless, this increasing attention to PBM claims a mandatory statement about parameters and data that must be clearly enounced in each scientific study, to reach in the shortest period a clear consensus about protocols permitting a valuable comparison of PBM efficiency with conventional medical treatments.

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Er,Cr:YSGG laser treatment of infected tissues in the course of periodontal diseases

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Abstract

There are few studies on the benefits of using the erbium–chromium laser in the treatment of periodontitis. This lecture presents the techniques of performing the Er,Cr:YSGG laser treatment of infected tissues in the course of periodontal diseases with the closed method, without forming an access flap in order to clean the bone defect and prepare the infected periodontal tissue and surface of the root cement. Cases and 6-month results of the conducted observations, evaluating the condition of the periodontium, will evaluate the application of an Er,Cr:YSGG (2780 nm) laser in regenerative procedure in the treatment of periodontitis. Patients with extensive periodontal breakdown were treated with an Er,Cr:YSGG laser for granulation tissue removal, bone and root decontamination and de-epitelialization of periodontal pockets and alveolar mucosa. In the regenerative procedure of bone defects, Emdogain® (EMG) and granulate of human allograft Maxgraft® were used.

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Laser-activated irrigation: On how the "power of the bubble" does make the difference in endodontic irrigation

Roeland de Moor (Belgium)

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Abstract

Laser-activated irrigation (LAI) with erbium lasers was marketed in 2009. This approach is based on the creation of expanding and imploding cavitation bubbles in the irrigation solution, resulting in three-dimensional spreading and agitation of the fluid in the root canal system. Hence, it is a powerful approach to clean and disinfect root canals. From activation with the fiber in the root canal, we evolved to the use of the laser tip positioned in the pulp chamber. Originally, the fiber was positioned in the root canal and moved up and down. Together with the development of super short pulses (50 µs), a new approach was launched in 2013. A double pulse modality was introduced in 2018 with the goal to enhance the disinfecting and activating efficacy of super short pulse (SSP) laser-assisted activation (PIPS). The Shock Wave Enhanced Emission Photoacoustic Streaming (SWEEPS) approach consists of delivering a subsequent laser pulse into the liquid at an optimal time when the initial bubble is in the final phase of its collapse.

During this presentation, the differences between the different approaches are clarified, the impact on and differences in their efficacy are demonstrated with high-speed imaging, and new insights on how LAI interacts with the biofilm are shared. Furthermore, data are provided on how this technology can outperform conventional irrigant activation techniques.

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(Online) Laser-activated irrigation: On how the "power of the bubble" does make the difference in endodontic irrigation

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Abstract

Since the beginning of this century, an evolution in the application of endodontic irrigation solutions has taken place. Different devices to activate irrigants have been proposed and marketed. Protocols for activation of endodontic irrigants were launched and investigated. There is the general sense that increased agitation of irrigants inevitably results in better root canal cleaning and disinfection. In a recent, not yet published systematic review, we came to the conclusion that it is almost impossible to compare the efficacy of sonic versus ultrasonic irrigation, taking into account recommended inclusion/exclusion criteria.

Studies on laser-activated irrigation (LAI) based on erbium laser-induced cavitation demonstrate its superiority over conventional approaches (sonically- and ultrasonically-activated irrigation). With more in-depth investigations on fluid streaming, the working mechanism of these systems became clear. Apparently, there is a difference in the level of acoustic streaming and in the type and impact of cavitation.

During this presentation, insight in the working mechanism and efficacy of irrigant agitation techniques, and we show how flow matters supported by high-speed images. Another aim is to highlight how laser use, though depending on the wavelength, can make the difference with the current non-laser-based cleaning and disinfection protocols and finally may satisfy the needs of modern endodontics.

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Vitamin D, laser and peri-implantitis management

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Abstract

Peri-implantitis is an immune-mediated biological complication that is estimated to affect 12–24% of dental implants. For more than 10 years, peri-implantitis was treated with antibiotics and mechanical periodontitis agents until they were considered ineffective. They have similar symptoms when assessed cross-sectionally. Both are characterized by clinical signs such as inflammation, bleeding, swelling of the oral mucosa, progressive alveolar bone loss, and histologically, the tissues are saturated with leukocytes with pro-inflammatory cytokines.

Importantly, the inflammation of the periodontium and around implants is associated with the presence of biofilms of appropriately different quality for the periodontium and the implant. This situation is additionally aggravated by the observed phenomenon of corrosion of titanium implants, and titanium dissolution products are active factors shaping the structure and diversity of the microbiome. Therefore, the antibiotic therapy used in periodontitis was not fully effective in peri-implantitis. It is required to establish a new algorithm of procedure and to select new chemo-mechanical means, including laser therapy, which will be more effective than those used so far, and will enable the development of a new model of peri-implantitis treatment. In addition, attention should be paid to general factors, such as the level of vitamin D or the presence of oxidative stress affecting the formation of systemic meta-inflammation, which worsens the prognosis in the course of peri-implantitis.

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(Online) Photobiomodulation therapy for the management of a severe inferior alveolar nerve injury

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Abstract

Despite a significant negative impact of nerve injuries on the quality of life, the methods for their management are still limited. This lecture is about an effective use of photobiomodulation therapy (PBMT) in the management of a severe alveolar nerve injury after 6 months of non-improved symptoms in a patient who underwent an extraction of his lower wisdom tooth. A total of 42 sessions of PBMT took place, and the application zone included intraoral and extraoral areas. In addition to the detailed case report, current in vitro and in vivo studies related to the use of PBMT in nerve injury will be illustrated. Hence, this lecture will give you a step-by-step protocol for the management of nerve injuries with PBMT.

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State of the art in the use of erbium lasers in ceramic restorations

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Abstract

In recent decades, the growing esthetic demand in dentistry has brought a greater demand for ceramic restorations. However, these restorations may represent a challenge in clinical dental practice in terms of adhesion to the dental substrate and its removal. In this scenario, erbium lasers may represent an interesting option, contributing to the success of clinical approaches. In addition to increasing the bond strength of some ceramic materials, they have certainly emerged as a new paradigm in the context of the removal of ceramic restorations, reducing clinical time for its removal and greater preservation of the remaining sound tooth structure. This presentation will describe the latest and greatest scientific evidence in the literature on the use of erbium lasers in ceramic materials and will discuss future perspectives.

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Smile esthetics and laser treatment

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Abstract

Traditionally, cosmetic therapies in the oral cavity are performed with cold or thermal blade surgical instruments and with rotary instruments. Currently, the growing demand for esthetic treatments in dentistry has meant that lasers are increasingly used for their characteristics in order to achieve esthetic treatment goals, starting to show their true potential in dentistry. The use of laser systems in the field of dentistry has now become a common procedure and represents a valid aid to traditional esthetic methods. In some cases, the laser has become the now irreplaceable "gold standard". We have come a long way since 1990, when the first laser for use in dentistry was accepted by the Food and Drug Administration (FDA). An increase in the fields of applications, techniques of use and sources available in dentistry in the last decade and the promises that are already shown in research today herald a "next big event" for the near future. After an examination of the methods of use and the fields of application of the different laser sources for the esthetic improvements of the soft and hard tissues of the oral cavity for ablative and regenerative purposes and of the perioral ones for "resurfacing" and the treatment of blemishes, the conditions are provided for creating knowledge of laser technology applied to the esthetic reconstruction of the smile, in order to favor an improvement and simplification of therapeutic treatments and to provide the operator with the tools suitable for the correct use of laser sources in daily clinical activity. However, some applications are still in their infancy and many controlled clinical and experimental trials will still have to be carried out to obtain an improvement in therapeutic protocols and procedures. Therefore, the choice of a laser or traditional therapy treatment will have to be carefully evaluated by the operator who will be able to discern the most suitable conditions for one or the other therapeutic application in order to obtain the best result for the patient's health and well-being.

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(Workshop) TwinLight Perio, gingivectomies, frenectomies, gingival recession coverage

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Abstract

For many intraoral soft tissue surgical procedures, lasers have become a reliable and desirable alternative to traditional blade surgery. However, the use of dental lasers in periodontal therapy is still controversial. Research has shown that non-surgical periodontal treatments with an Er:YAG laser could be a promising alternative to reduce and control the proliferation of microorganisms in persistent periodontitis. The Er:YAG laser ablates periodontopathic bacteria by thermal vaporization, and its bactericidal effect on diseased root surfaces appears superior to that of ultrasonic scaler. Combined laser treatment with Er:YAG and Nd:YAG effectively improves periodontal clinical parameters and could be an alternative to conventional flap surgery. The frenum is a mucosal fold that connects the lip and cheek to the alveolar mucosa, gingiva and underlying periosteum. The frenulum can compromise the health of the gingiva if it is too close to the gingival margin, either due to a disruption in plaque control or muscle pull. In addition, the maxillary frenulum may cause esthetic concerns or compromise the orthodontic outcome in a midline diastema, causing recurrence after treatment. Treatment of such a deviated frenulum is by conventional blade or erbium or neodymium laser frenectomy or frenotomy. Periodontal plastic surgery is used to restore the form and function of the gum tissue, the periodontal ligament and the bone supporting the teeth or a single tooth. Most periodontal esthetic procedures fall into one of the following areas: crown lengthening, alveolar ridge preservation/augmentation, soft tissue grafts, and correction of an open interproximal space. Soft tissue abnormalities, with the exception of loss of the interproximal papilla, can be predictably corrected, improving esthetics and even creating restorative possibilities. In addition to a discussion of conventional periodontal plastic surgery, an overview of possible laser-assisted periodontal plastic procedures will be presented. The Er:YAG laser is safe and suitable for esthetic periodontal soft tissue treatment, as it significantly ablates the soft tissue and allows for fast and favorable wound healing.

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(Online) Use of laser photobiomodulation in the treatment of trigeminal neuralgia: A case series

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Abstract

Laser photobiomodulation is a therapeutic technique that uses low-intensity light to stimulate regeneration and repair of damaged tissues. When associated with research with mesenchymal stem cells from the umbilical cord, it becomes a tool that improves results and directly impacts regenerative medicine. In recent years, artificial intelligence (AI) has been increasingly applied in these types of research to help with data analysis in order to optimize the delivery time of results, increase assertiveness and reduce operating costs. The objective of this study was to analyze the impact of the use of AI in research with laser photobiomodulation associated with research on mesenchymal stem cells from the umbilical cord. The methodology used involved the review of recent studies that explored the application of AI in therapies with laser photobiomodulation and umbilical cord mesenchymal stem cells. The results indicated that AI can help improve the precision and effectiveness of laser photobiomodulation treatments and, when associated with stem cell research, it helps to identify important images, patterns, genes and proteins. It quantifies and characterizes cell morphology and activity. It analyzes genomic data and identifies genes and signaling pathways involved in cell differentiation and regeneration. Moreover, it improves the understanding of stem cell behavior and its interaction with the environment. The relevance and benefits of applying AI in this research helps identify the best light sources to stimulate the regeneration of damaged tissues, optimizing treatment protocols for different injuries. It provides high accuracy in the analysis and interpretation of data generated by surveys. Artificial intelligence predicts the results accurately and enables the development of new treatments, in addition to developing smart and automated solutions quickly and efficiently. It improves the quality of health care and can help predict treatment effectiveness in different patients and monitor treatment response over time. However, challenges were also discussed, such as the need to develop robust AI models and the ethical concern regarding the use of patient data. Future trends indicate that AI will continue to be an important tool in laser photobiomodulation research, and that new data analysis techniques can be developed to further improve the effectiveness of treatments. In conclusion, the application of AI in laser photobiomodulation research could have a significant impact on the effectiveness of treatments and understanding of underlying mechanisms. However, it is important to consider the challenges and ethical concerns associated with the use of AI in medicine and to ensure that AI models are developed responsibly and with consideration for patients' rights.

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Debonding of ceramic veneers with laser: The clinical reality in contrast with the scientific evidence

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Abstract

In the oral presentation, the author will outline several studies on the treatment of ceramic veneers with laser. These compare the debonding resistance of ceramic veneers and determine the type of failure (adhesive or cohesive) after treatment with and without the Er,Cr:YSGG laser, using a variety of fluences, thicknesses and types of ceramic and cementing materials, both in bovine and human teeth.

Likewise, the limitations of in vitro studies will be discussed in comparison with the parameters found in scientific evidence. The author will show some videos to confront them with the clinical reality.

Using the Er,Cr:YSGG laser is an adequate and safe technique to remove ceramic veneers, but research needs to be continued and deepened with additional studies. These should be oriented at determining more precise parameters that allow ceramic veneers to be removed with the laser in shorter procedure times, but without affecting the remaining dental tissues. Besides, they should take into account the clinical variability in relation to the different ceramic materials, the type of restoration, thickness, type of abutments and cementation materials, among others.

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Periodontitis and laser management

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Author of international book's chapter: 2022: Dominiak Marzena, chapter titled: Lasers in Oral Surgery; 2021: Monographs: Lasers in Implant Dentistry, The Official Publication of the American Academy of Implant Prosthodontics; 2021: Georgios E Romanos' book "Light Therapy in Dentistry: Efficacy, Uses and Limitations", chapter titled "Laser Debonding", Nova Publisher; 2019: World Federation for Laser Dentistry book, chapter titled "Non-surgical Periodontal Pocket Treatment".

Abstract

Periodontal inflammation around teeth and implants is associated with specific periodontal pathogens. The increasing number of infections, the negative impact on systemic diseases and evidence of complications during implant treatment highlight the need for dentists to search for cause-and-effect relationships to identify efficacious treatment(s).

One of the main causes of periodontal complications is the interaction between specific bacterial biofilms and the associated host inflammatory response. To ensure long-term success and a highly predictable treatment outcomes, dentists should be heedful of the first signs of inflammation and perform effective treatments. To achieve an effective treatment, periopathogens need to be eliminated. Usually, conventional treatments are complemented with additional antibacterial therapy with the use of antiseptics. However, research has so far proven the efficacy of laser therapy, as an adjunct to the conventional treatment. Laser technology, despite of the controversy, is becoming increasingly popular in everyday dental practice because it provides predictable treatment outcomes and is well accepted by patients. Laser treatment is used for the decontamination of periodontal tissue and the cementum on the root surfaces. It is a non-invasive medical treatment as it relies on the strong bactericidal and detoxifying properties of the laser. During the lecture we will consider the novelty of using laser therapy in combination with antiseptics as an alternative treatment protocol.

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Oral neuropathic pain management with PBM therapy: A prospective analgesic pharmacotherapy-paralleled feasibility trial

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Prof. Hanna has received publications in over 34 peer-reviewed papers on the use of photobiomodulation, aPDT and surgical lasers in various medical and oral applications, and wrote 2 chapters in 2 books on photobiomodulation therapy in wound healing and management of oral complications induced by head and neck cancer treatments. In March 2022, Prof. Hanna received "Life Achievement Award" from European Medical Laser Association for valuable contributions to the laser community.

Abstract

Neuropathic pain (NP) can be challenging to treat, as analgesic pharmacotherapy (MED) can reduce pain, but the majority of patients do not experience complete pain relief. Our pilot approach is to assess the feasibility and efficacy of an evidence-based photobiomodulation (PBM) intervention protocol. This would be an alternative to paralleled standard analgesic MED for modulating NP intensity-related physical function and quality of life (QoL) prospectively in a mixed neurological primary burning mouth syndrome and oral iatrogenic neuropathy study population (n = 28). The study group assignments and outcome evaluation strategy/location depended on the individual patient preferences and convenience rather than randomization. Our prospective parallel study aimed to evaluate the possible pre/post-benefit of PBM and to allow for a first qualitative comparison with MED. Various patient-reported outcome measures (PROMs) based on Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT II) were used for a nine-month follow-up period in both intervention groups (PBM and MED). The PBM protocol applied to the PBM group was as follows: λ810 nm, 200 mW, 0.088 cm^2, 30 s/point, 9 trigger and affected points, twice a week for 5 consecutive weeks, whereas the MED protocol followed the National Institute of Clinical Excellence (NICE) guidelines. Our results showed that despite the severe and persistent nature of the symptoms for 57.50 ±47.93 months at baseline in the PBM group, a notably rapid reduction in highest Pain Intensity Score (PISmax) on visual analogue scale (VAS) from 7.6 at baseline (T0) to 3.9 at one-month post-treatment (T3) could be achieved. On the other hand, mean PISmax was only reduced from 8.2 at baseline to 6.8 at T3 in the MED group. Our positive PBM findings further support more patients' benefits in improving QoL and functional activities, which were considerably impaired by NP such as: eating, drinking and tasting, whereas the analgesic medication regimens did not. No adverse events were observed in both groups. To the best of our knowledge, the study is the first to investigate PBM efficacy as a monotherapy compared to the gold standard analgesic pharmacotherapy. Our positive data show statistically significant improvements in patients' self-reported NP, functionality, psychological profile, and QoL at mid- and end-treatment, as well as throughout the follow-up time points (1, 3, 6, and 9 months). The improvements sustained up to 9 months in the PBM group compared to the MED group. Our study, for the first time, proves the efficacy and safety of PBM as a potent analgesic in oral NP and a valid alternative to the gold standard pharmacotherapy approach. Furthermore, we observed long-term pain relief and functional benefits that indicate that PBM modulates NP pathology in a pro-regenerative manner, presumably via antioxidant mechanisms.

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Effect of antimicrobial photodynamic therapy in the nasal decolonization of chronic hemodialysis patients: A single-blind randomized pilot study

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Abstract

Background. *Staphylococcus aureus* infections are an important cause of mortality in patients with chronic kidney disease (CKD) undergoing hemodialysis (HD) treatment. It is known that previous nasal colonization with this agent is a risk factor for infection. Nasal decolonization reduces infection rates; however, the repeated gold-standard treatment induces antibiotic resistance. Antimicrobial photodynamic therapy (aPDT) is a promising treatment due to its bactericidal effect and no antibiotic resistance. Therefore, this study aims to compare aPDT with mupirocin for nasal decolonization among nasal carriers of *S. aureus* in hemodialysis patients.

Materials and methods. A randomized, controlled follow-up pilot study of 34 participants distributed into G1 (n = 17) – decolonization with aPDT (λ = 660 nm, 400 mW/cm^2, 300 s, methylene blue 0.01%, single application) and G2 (n = 17) – decolonization with mupirocin (twice a day, 5 days) was conducted. Nasal swabs were collected to identify the carrier state 1 and 3 months after the intervention.

Results. All 17 participants randomized to photodynamic therapy and 13 of 17 (77%) randomized to mupirocin were adherent to treatment. Among the participants, 12/17 (71%) had negative cultures compared with 13/17 (77%) treated with mupirocin (p = 1.000; risk ratio (RR): 0.92, 95% confidence interval (95% CI): 0.61–1.38). Moreover, 67% of patients who had negative cultures at T1 were recolonized within 3 months. There were no adverse events in the photodynamic therapy group. Limitations: Restricted to nasal colonization and infectious complications were not assessed.

Conclusions. Photodynamic therapy is a feasible approach to treating *S. aureus* nasal carriage. Future larger studies should be conducted to determine whether photodynamic therapy is equivalent to the standard of care with mupirocin.

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Success with ceramic veneers: Protocols for minimal preparation and predictable bonding

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Specialist Prosthodontist at New York Dental Clinic who trained as a prosthodontist in India. He relocated to Dubai in 2003 and has since worked as specialist prosthodontist. At present, he runs a boutique multispecialty practice, the New York Dental Practice in Dubai. He has been an international speaker at numerous conferences and has conducted workshops. He has published and written an article on ceramic veneers and composite resins. He is an honorary member of a group Style Italiano, which is at the forefront of teaching and innovating new products in dentistry. Currently, he also serves as the country chairperson for the prestigious European Society of Cosmetic Dentistry. His focus is to be at the forefront of contemporary restorative and esthetic dentistry.

Abstract

Since centuries, there has been a desire to look better. The smile is the most contrasting element of the face and has to be in harmony with it. Though marketing campaigns encourage people to have whiter and brighter teeth, these aspects can be modified up to a limit.

Why should the teeth/prostheses we give to our patients be any different? They should be manufactured in harmony with the face and personality of the individual.

In the same way, ceramic veneers should be made to look, feel and function like natural teeth. The long-term success defined by key elements of biology, function and esthetics is possible with how successful one is in bonding restorations to tooth tissues and the correct treatment planning. This presentation focuses on how we can conserve tooth tissue and achieve positive results with minimally invasive approach. It will also suggest and highlight the right bonding protocols. These concepts and more simplified techniques regarding ceramic veneers will be presented.

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(Online) Er:YAG pulp capping: A case series

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Abstract

Background. Successful laser-supported direct pulp covering – pulp capping – requires procedures performed in the same way as the endodontic treatment - the isolation of the tooth and as much as it can be done antiseptically and aseptically. Pulp capping can avoid endodontic treatment of the tooth with reversible pulp inflammation, and is much easier than endodontic treatment, requiring less time to perform the whole procedure, and being less stressful for both dentist and patient.

Objectives. In this presentation, clinical classification and easy step-by-step procedure of pulp capping supported by the Er:YAG laser, LightWalker and efficacy were shown.

Materials and methods. This is a report of 6 fully documented clinical cases (including photos of each step of the procedure and X-rays before and after treatment) of using the LightWalker Er:YAG laser for pulp capping. In every case, I covered pulp in the same way, starting from the direct pulp covering with new generation bioactive bioceramic material to the final buildup of the tooth.

Results. Consequently, provided pulp capping procedure can save vital pulp in 9 out of 10 cases, which is very promising and predictable. Survivability of pulp capping is about 92% in 1-year follow-up, which is confirmed in literature.

Conclusions. High survivability ratio of pulp capping is a result of a meticulously provided procedure (starting from isolation of the tooth with rubber dam to the final adhesive buildup), the use of the Er:YAG laser and the choice of direct covering material.

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(Online) Laser magnification: A review with clinical cases

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Dr. Nitish Kamboj after completing his BDS in 2006, has done his fellowship in laser dentistry at WCLI USA in 2010. In 2012, he finished laser therapy course at THOR and obtained his diploma and masters in laser dentistry from Sola (Vienna, Austria) in 2013. In 2016, he finished the fellowship in implant dentistry (Lisbon, Portugal) and was trained by Dr. Maxim at Belograd Academy (Ukraine, 2018). In year 2020 he completed his masters course in bone grafting procedure at Bern University and obtained his second masters in laser dentistry from LAHA (Slovenia) in 2022. Internationally and nationally, he has delivered many lectures regarding laser and microscope and how laser can be used under magnification. Dr. Nitish Kamboj has started the first photobiomodulation center in north India to educate and treat patients.
He is a key opinion leader for many companies such as Zeiss, C J Optics Ltd., Sirolase Blue Laser, Fotona Laser, Picasso Laser, etc. He pursues his passion for teaching by running the YALD Academy, where he teaches laser and magnification, conducting many live courses along with hands-on workshops.

Abstract

Operating microscope have been used for decades in many medical disciplines: ophthalmology, neurosurgery or vascular surgery. However, the introduction of operating microscope to dentistry has happened many years later. In 1978, Dr. Apothekar and Dr. Jako brought the concept of extreme magnification in the form of operating microscope into dentistry. First commercially available dental operating microscope was introduced in 1981. The human eye is one of the most complex organs used for magnification but it is insufficient to see details of the fractured and carious tooth. For a clinician, observing a tooth enlarged at maximum resolution is possible from a distance of 25 cm, which is impractical in a clinical setup.
Until now, the magnification has been discussed in endodontics, periodontology, surgery, etc. I want to analyze the use of magnification device for our laser. Under magnification we can control hand movement, wattage or frequency, which can drastically change the final results. Once we start using this photonics energy under magnification, the true laser response can be seen and felt and what magnification is seeing makes you believe. You can make your patient see and feel the true magic of laser in our dentistry.

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(Online) LessPrepEndo: Is the paradigm shift in endodontics ahead of us?

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Graduated from School of Dentistry at Wroclaw Medical University in 2009. Vice President of Section of Endodontics of Polish Dental Association, Cofounder of Dental Masters Group, Silver Member of Style Italiano Endodontics, European Society of Endodontology, Polish Society for Laser Dentistry, World Federation for Laser Dentistry, Polish Endodontic Association. Co-author of the book „Endodoncja w ujęciu klinicznym", ed. Prof. Marta Tanasiewicz. He is one of the Masters of Dentistry according to eDentico journal. Since 2013 he has given over 400 lectures and hands-on trainings in 13 countries on 4 continents. So far, more than 4000 participants from 35 countries attended his workshops.

Abstract

All clinicians agree that the elimination of infection from the root canal system is one of the most fundamental procedures in the endodontic treatment. Up to now, most clinicians have performed the shaping protocol to eliminate the infected dentin and enhance it with the irrigation. The most popular accessories for proper activation of the irrigants are sonic and ultrasonic devices. As soon as the Er:YAG lasers were introduced to the endodontics we could redefine the shaping procedures of the root canals. During the lecture you will learn how the LessPrepEndo protocol with the SWEEPS technology can enhance the root canal shaping and disinfection.

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(Workshop) A clinical guide to modern root canal therapy

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Dr. Mustafa Gündoğar is a graduate of Marmara University, Faculty of Dentistry, where he received his DDS degree in 2005. He attended Endodontics Program of Graduate Study, offered by the Institute of Health Sciences at Marmara University and graduated with PhD degree in Endodontics in 2011. Since 2020, he is working as Associated Professor in the Department of Endodontics, Faculty of Dentistry at Medipol University, İstanbul, Turkey. His areas of interest are: nickel titanium file's kinematic properties, cyclic fatigue resistances of Ni-Ti Rotary systems, and latest trends in endodontic irrigation. Dr. Gündoğar is also one of the inventors of Turkey's first patented nickel titanium reciprocation file. Dr. Gündoğar has been been working at the Regenerative and Restorative Medicine Research Center (REMER) since 2020 and mainly focuses on artifical intelligence and regenerative endodontics and laser technology in endodontics. He is a renowned speaker and is frequently invited to major national and international conferences in Turkey. Dr. Gündoğar has published more than 50 original research articles in national and international peer-reviewed and indexed journals. Dr. Gündoğar is working as a reviewer for many indexed international journals. He has attended various national and international congresses, symposia, courses, and conferences. Dr. Gündoğar is an active member of the Turkish Dental Association (TDB), Turkish Endodontic Society (TED), European Society of Endodontology (ESE).

Abstract

The success of root canal treatment depends on the complete removal of infected microbial content from the root canal system. Today, with the development of nickel–titanium rotary file systems, root canal shaping has become quite simple and fast. Despite mechanical reduction of the bacterial population, it is not possible to eliminate the whole bacteria and root canal debris without the use of antibacterial solutions and activation systems from the root canals.

New technology makes it possible to clean the root canal space without damaging the tooth structure. In this presentation, characteristics of known and developing root canal irrigation agents and irrigation methods will be evaluated under the light of current literature. During this workship, all participants will be guided step by step through all of the procedures of laser-assisted endodontics. We will begin with the scientific principles of the lasers in endodontics, followed by the importance of irrigation protocols and show the clinical approach of this kind of therapy. All the participants will experience the journey to the 22nd century of endodontic treatment.

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(Online) Use of 445nm blue laser in contemporary dentistry and dental sleep medicine

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BDS (Liverpool); DGDP (UK); MGD (CDSHK); MSc (RWTH Aachen); PhD (HKU). Dr. Kenneth Luk obtained his BDS at the University of Liverpool in 1987. He spent the early years of practice in the UK. Dr. Luk served as part-time Clinical Lecturer at the University of Hong Kong for over 10 years and has been in private practice since returning to Hong Kong in 1995. Dr. Luk has incorporated lasers in dentistry since 2002. Pursuing his passion for lasers, he obtained the MSc in Lasers in Dentistry at Aachen University, Germany, in 2013. In 2021, Dr. Luk achieved PhD in Laser Research at the University of Hong Kong. He is also interested in incorporating lasers in dental sleep medicine. Dr. Luk is currently the secretary of the Asia Pacific Division of the World Federation for Laser Dentistry (WFLD). He is active in research and publications in laser dentistry. Dr. Luk is the editorial board member of the journal Lasers in Dental Science.

Abstract

Blue diode wavelength (445 nm) has been used in the dental market for over 5 years. It is a relatively new laser compared to near-infrared (NIR) diode lasers. Its clinical applications are similar to NIR lasers. The unique optical property and tissue interaction of this wavelength offer additional clinical applications such as:

- non-ablative melanin depigmentation technique;
- additional wavelength for photobiomodulation;
- management of tissue healing in surgery combination diode laser (blue, red, NIR) approach.

Sleep apnea or sleep disorder are hot topics gaining great attention in medicine. The function of mastication, swallowing and breathing is key to our well-being. These functions are related to dental sleep medicine. Tongue and lip tie release by blue laser improve the myofunction for better mastication, maxillofacial development and quality of sleep.

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(Online) Laser-assisted orthodontic surgery with mini-implants

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Abstract

The use of lasers in orthodontic surgery is a method of treatment that improves the predictability of the treatment and is well received by patients. Lasers in orthodontic treatment allow for the exposure of retained teeth (canines) with good visibility of the treatment area, enable shortening of orthodontic treatment, reduce pain during treatment with fixed appliances, and reduce the risk of complications (root resorption).

Combination of the advantages of high-power lasers, a diode laser with wavelengths well absorbed by hemoglobin and melanin, and an erbium laser (Er:YAG, 2940 nm) with the highest absorption coefficient in water allows to perform treatments on soft and hard tissues in the most effective way. In addition, using low-power diode lasers has many advantages, such as improving bone and soft tissue healing and reducing swelling, inflammation, and pain after various orthodontic surgery procedures.

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Use of erbium laser on esthetic restorations

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Abstract

Esthetics has gained importance in dentistry, reflecting a growing demand by patients who seek an enhanced appearance. In this context, several technologies were developed to help clinicians in achieving good results with less substrate loss. The erbium lasers are being widely used on anterior restorations for its favorable outcomes over a conventional cavity preparation and resin composite removal by burs. However, they should be used carefully, with safe protocols and well-trained professionals. This presentation will discuss with scientific evidence and clinical protocols the use of erbium lasers on esthetic restorations.

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Lasers in oral surgery

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Marco Meleti graduated from Dental School at the University of Parma, Italy, in 2002, where he did a two-year post-graduate internship in Oral Medicine. From 2004 to 2006 he worked at the Department of Oral and Maxillofacial Surgery/Oral Pathology of the Free University Medical Center/ACTA in Amsterdam, the Netherlands, where he earned his PhD in 2008. In 2007, he did an internship in Oral Medicine at the Department of Oral Medicine of the University of San Francisco, California. He has served as General Secretary of the European Association of Oral Medicine (2010–2014) and as Regional Representative of EAOM Region 4 (2008–2010 and 2018–2021). In 2016, he has co-represented Europe during the first Global Oral Cancer Forum in New York. He co-chaired the 13th Biennial EAOM Congress in Turin, Italy (2016). Since 2021, he has been the President-Elect of the EAOM. His main research interests include the use of novel technologies (e.g., lasers) in oral surgery, the study of potentially malignant disorders of the oral mucosa and salivary diagnostics. He is the author of 168 scientific papers in peer-reviewed journals and co-author of several books of oral medicine (h-index: 25).

Abstract

Lasers have been widely employed in the management of many conditions affecting the oral cavity. Different wavelengths can interact selectively with hard or soft tissues, offering a wide range of option to the clinician. Neodymium yttrium aluminum garnet (Nd:YAG), diode and erbium (Er):YAG lasers have been reported to be useful for the treatment of benign, vascular and potentially malignant disorders (PMDs) of the oral mucosa as well as for a number of diseases of the jawbones. Some controversies of laser surgery concern the accuracy of pathological diagnosis as well as the control of thermal damage on the target tissue. However, if precise operative procedures and the appropriate power and frequency parameters are used, it seems possible to reduce thermal injuries and support the wound healing processes.

Good hemostasis with less peripheral tissue injury and post-operative pain than cold blade and electrosurgery and a more rapid recovery are reported in the literature for most wavelengths. Because of intra-operative control of bleeding and anti-bacterial and bio-stimulating properties, Nd:YAG, Er:YAG and diode lasers undoubtedly offer a chance for the surgical treatment of many oral conditions.

Quantic Molecular Resonance (QMR scalpel) is a new technique that applies high frequency waves and is indicated for several surgical treatments. It is a remarkable advance from conventional electrosurgery, and consists of non-traumatic cutting of tissue and possibly contemporary coagulation. The cut is achieved by the explosion of intracellular and infracellular liquids resonating with a special frequency.

The lecture is focused on long-term experience of the surgical treatment of disease of the oral cavity through technologies such as Nd:YAG and Er:YAG lasers and QMR scalpel.

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Effect of vascular photobiomodulation on sleep quality

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Abstract

The quality of sleep is directly linked to the quality of life. It is believed that the technique known as vascular photobiomodulation (FBMV) decreases blood viscosity and platelet aggregation, activates superoxide dismutase, promotes increased oxygen content and stimulates microcirculation, also stimulates increased serotonin production and reduced cortisol. Serotonin function is related to the onset of sleep, mood improvement, anxiety, and depression. Given this, we evaluated the effect of FBMV through a clinical trial, in which patients presented complaints of low sleep quality. Same frequency and time of application, but with placebo equipment with light emission without therapeutic power (<1 mW). At patient admission, both groups completed the questionnaires on sleep quality (PSQI and Epwort) and at the end of 6 sessions, the questionnaires were collected again. Through the results of the FBMV group (initial PSQI 10.24 – final PSQI 6.47/initial ESS 10.44 – final ESS 10.12) it was possible to observe positive effects on sleep quality, sleep latency and control of daytime sleepiness demonstrated through a significant decrease in PSQI scores. Through the data presented on FBMV without showing a non-invasive technique that emerges as a therapeutic possibility to contribute to sleep quality, the data are promising mainly in the PSQI scores that relate to the overall sleep quality and are consistent with results of improvement and reduction of scores found in clinical trials of pharmacological or non-pharmacological treatment strategies. Data encourage future investigations, especially regarding the mechanisms involved, better dosimetry, and time of application.

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At the crossroads of oral and mental health: Emerging concepts and clinical implications

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Abstract

It is now clearly apparent that individuals with mental disorders, especially those with severe mental illness, have reduced life expectancy, mostly due to comorbid somatic health impairments. Apart from cardiovascular diseases, these comorbidities include, i.e., poor oral health characteristics. Accumulating evidence suggests that this association might be bidirectional and covers a number of social, psychological, behavioral, and biological processes. Interestingly, it has been shown that poor oral health associated with microbiome alterations and subclinical inflammation might be causally related to the development of some mental disorders. Nevertheless, effective and scalable interventions targeting the burden of oral health impairments in people with mental disorders have not been developed so far. This lecture will focus on specific mechanisms linking mental and oral health. Moreover, directions for the field to develop effective interventions at the level of public and individual health will be provided.

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Lasers in esthetic dentistry

Shigeyuki Nagai (Japan)

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Abstract

Lasers have been be used for various treatment procedures in dentistry. Especially in recent years, the understanding of the clinical application of lasers has deepened, and lasers have come to be used in more complicated and difficult cases. The usage of lasers has made treatment easier, faster and more reliable. In particular, treatment in the esthetic area is often complicated and difficult because esthetics are evaluated at the same time as their function. The treatment must be done under enough examinations and diagnosis. Since there are various types of lasers used, a good prognosis can be expected by selecting the appropriate device for each treatment. Since dental treatment targets teeth, gums and bones, the key to success is an understanding of each tissue and the selection of laser device. Selecting the correct laser device and setting appropriate parameters for treatment lead to successful esthetic dentistry.

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(Online) Clinical risk management in laser dentistry

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Abstract

The classification of laser equipment defined by International Electrotechnical Commission (IEC) is widely used. The classification is based on the degree of danger of the laser equipment to the human body. Care must be taken not to irradiate the human body with the laser beam, but if the benefits outweigh the profit and loss, the human body is irradiated with the laser. A typical irradiation to the human body with laser light is a medical practice. Medical laser devices have been used for treatment and examination. Many laser devices have also been used in dentistry. Now the laser treatment has become commonplace in dentistry, thus it is necessary to pay attention to its safe use. This lecture will discuss safety controls and possible accidents and complications that can occur when using laser equipment in dentistry.

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Diode (980 nm) laser-assisted clinical non-surgical treatment of periodontal infra-bony pockets

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Abstract

Background. Mechanical debridement is the gold standard in the periodontitis therapy. However, it is suggested that adjunctive use of lasers can result in a more effective treatment outcome.

Objectives. To evaluate the efficiency of diode laser-assisted nonsurgical therapy of periodontitis as adjunctive to scaling and root planing (SRP).

Materials and methods. One hundred sixty vertical bone defects (pocket depth (PD) at baseline ±6 mm) had been randomly allocated to receive SRP alone (group C) or SRP coupled to a diode laser (980 nm) protocol (group C+L): SRP, irrigation with hydrogen peroxide solution (3%), de-epithelization of the internal and external gingiva followed by blood stabilization, and coagulation by laser beam were made. Beam parameters: 10 ls/pulse duration, 10 kHz, pick power of 10 W, average power of 1 W, and fiber diameter of 400 lm. Plaque index (PI), bleeding on probing, gingival recession (GR), clinical attachment level (CAL), and PD were measured at baseline, at 6 weeks, 12 weeks, 18 weeks, 6 months, and 12 months. Microbiological data were collected randomly from 26 pockets from both groups at baseline, 6 weeks, 12 weeks, and 6 months after treatment.

Results. At all periods of follow-up, there was a significant difference between both groups in all clinical parameters except for GR. In group C+L, 76% of pockets had PD: 3 mm after 12 months of follow-up and an average of PD = 1.77 ±0.46 mm, while 56% of pockets in the control group (C) had an average of PD = 5.00 ±0.83 mm after 12 months of follow-up. Total bacteria count in group C+L was significantly lower compared to group C only at 12 weeks and 6 months of follow-up. Furthermore, there was high significant decrease in the number of *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, *Tannerella forsythia*, and *Prevotella intermedia* at all the follow-up periods.

Conclusions. As adjunctive to SRP, diode laser-assisted nonsurgical therapy of periodontitis has significantly improved clinical parameters of PI and POB and has significantly reduced the clinical attachment loss and PD compared to the control group after 1 year of follow-up. A significant reduction in periodontal pathogens has been observed in group C+L only at 12 weeks and 6 months of follow-up.

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(Online) Laser-assisted implantology: From predictability to complications treatment

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Dr. Nawrocki graduated from the Dentistry Department of the Medical Academy of Gdansk in 1998. Beginning in 1999, he worked as an assistant at the Department of Prosthodontics at the same Academy, where he earned recognition as a diligent and well-respected doctor. In 2001, Dr. Nawrocki opened his own dental clinic, LEKARZSTOMATOLOG.COM, upholding the highest international standards of dental treatment. Combined with excellent communication and professional skills, Dr. Nawrocki provides the highest international standards of dental care for his patients. He continually upgrades his qualifications and skills by participating in various courses and advanced trainings for dental specialists both in Poland and abroad. He specializes in implantology, CAD/CAM techniques, implant-guided surgery, and the latest laser-assisted restorative and surgical techniques. In 2009, he received a Certificate of Implantology from the prestigious Goethe University in Frankfurt, Germany. In 2013, he equipped his clinic with the CAD/CAM System – CEREC by Sirona and in 2016, acquired the Fotona Laser LightWalker system. In 2015 and 2016, he attended the MPI Implant Prosthodontic Program at the Mediterranean Prosthodontic Institute in Spain and at the University of North Carolina in Chapel Hill, USA. In 2016, Dr. Nawrocki commenced his post-graduate studies "Master of Science in Lasers in Dentistry" at RWTH University in Aachen, Germany and in 2018 he defended his master thesis. In May 2022, Dr. Nawrocki defended his PhD thesis at Medical University of Bialystok: „Comparison of surgical and non-surgical treatment of peri-implantitis with the use of Er:YAG and Nd:YAG laser". Dr. Nawrocki organizes courses in implantology, CAD/CAM, and laser treatment in his Clinic. He is Key Opinion Leader for Dentsply Sirona and lectures at many international Congresses. Since 2015, he has been running the new NAWROCKI CLINIC where, together with his wife (now the co-owner), a team of dentists, and dental technicians, provide their patients with the highest level of dental care.

Abstract

Dentistry is a rapidly developing field of medicine. Technologies which only a few years ago were unheard of and unattainable are now more and more frequently used in various clinical procedures. During the lecture, the protocols of treatment with the use of Nd:YAG and Er:YAG lasers and CAD CAM technology will be presented in the course of different dental procedures, being part of implantological and surgical treatment. Intra-oral scanning and digital planning (computer navigation) allows us to treat extremely demanding cases in a quick and predictable way, but very often the use of lasers is crucial to achieve the final success. Lasers are the state-of-the-art and the most advanced technology used in dentistry. The Er:YAG and Nd:YAG lasers are highly versatile tools. Very often our procedures and treatment are not possible to be conducted without lasers, and sometimes they are devices which support our work and enable us to achieve better results. During the presentation different indications for the use of lasers will be shown and among others: digital protocols of procedure in immediate implantation with immediate loading. The presentation will also list the advantages of laser use in comparison to the conventional treatment. Such approach equips us with convenient and predictable treatment protocol in implantology, surgery and prosthetic restorations in the esthetic zone. Although the method is safe and predictable, some complications like peri-implant inflammation can appear. There are a lot of different risk factors which can influence prevalence of those inflammations. In recent years, with a view to improving effectiveness and minimizing the invasiveness of peri-implant tissue treatment, there is more and more attention given to the possibility of using lasers with different wavelengths. The key issue in peri-implantitis treatment is conducting the effective decontamination of infected implant surface and eradication of the surrounding inflammation in order to obtain stable condition. During the lecture the comparison of two methods of peri-implantitis treatment with the use of the Nd:YAG and Er:YAG lasers will be presented.

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Laser applications in facial esthetics

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Abstract

In recent years, smile rejuvenation has become one of the most popular elective dental services around the world. The introduction of a multi-disciplinary approach in treatment planning, the launches of hard and soft tissue digital scanners together with planning software such as Digital Smile Design have helped boosting patients' acceptance and resulted in more predictable outcomes for both patients and dentists. We do forget another important key player. It is the skin draping over our laborious dental work. Technologies offered by one particular dental laser, Fotona LightWalker, are capable of delivering skin rejuvenation treatments. Technologies, applications for facial esthetics, relevance to smile rejuvenation, and business set-up will be discussed. A separate workshop demonstrating various procedures will follow.

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Evaluation of initial result of 3D application in mandibular reconstruction by free fibula flap

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Research areas: esthetic laser and surgery, conventional plastic and reconstructive surgery: cleft lip and cleft palate repair, maxillary reconstruction, reconstructive microsurgery: mandibular reconstruction, maxillofacial reconstruction, esthetic surgery: blepharoplasty, rhinoplasty, breast augmentation.

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Abstract

Background. Microsurgery is a highly complex technique that requires specialized equipment and steady surgical methods. We conducted a retrospective review of the development progress of microsurgical techniques at Hanoi National Hospital of Odonto-Stomatology (NHOS) during the past 12 years.

Materials and methods. Retrospective study assessing the training and developing process of microsurgical techniques at NHOS in 12 years.

Results. The NHOS has performed 665 microsurgical flap reconstructions after surgical removal of large tumors in maxillomandibular area. A total of 441 fibular free flaps were harvested for mandibular reconstructions after resections of ameloblastoma and osteofibroma. Four fibular flaps were used for maxillary reconstructions. A total of 119 osteocutaneous fibular free flaps were harvested for mandibular reconstructions in oral cancer surgeries. Eighty-three lateral arm flaps and 13 anterolateral thigh flap reconstructions were performed following cancer ablations. Five patients underwent reconstruction after cancer resection with 2 fibular free flaps and anterolateral thigh flaps. Success rate was 654/665 (98.35%). The implementation of microsurgery technique at NHOS has been carried out for only 12 years but rapid and significant progress has been made. Free flap reconstruction is a flexible reconstructive option to restore essential functions and esthetics of the facial area and to improve the patient's quality of life.

Conclusions. The NHOS is a large facility specializing in odonto-stomatology and oral surgery. Reconstructive intervention after surgical removal of diseased area is very important. The resection of large benign tumors or malignant tumors always leaves big defects that cannot be repaired with conventional reconstructive techniques. The advent of microsurgery has encouraged surgeons to use free flaps to overcome the challenges faced by reconstructive surgery using conventional techniques. Microsurgical techniques were originally developed since the 1970s. In the 1980s, Dr. Nguyen Huy Phan developed microsurgical techniques in Vietnam. The first microsurgeries were performed at 108 Military Central Hospital. The NHOS took initiatives to perform the first microsurgeries in 2008. In this review, we report the progress of surgical approach, training and development of microsurgery at NHOS from 2008 to 2020. We access the number of performed microsurgeries, types of free flaps, pathological conditions that require microsurgery, complications, and surgical outcomes, as well as the success rate after surgery.
Oral cancer is the 6th most common malignancy worldwide. In Vietnam, afflicted patients often visit hospitals for diagnostic tests and treatment with advanced-stage and large tumors. Oral cancer does not respond well to radiation or chemotherapy, so extensive tumor resection and cervical lymphadenectomy are the best treatment options. Wide surgical excisions of tumor often leave major maxillomandibular defects such as mandibular-oral floor defect, oral floor defect, partial or total tongue defect, tongue-oral floor defect, cheek mucosa defect, orofacial fistula. The reconstruction of these defects requires careful selection of suitable free flaps. We have harvested 119 osteocutaneous fibular free flaps to reconstruct the mandibular and to cover the oral floor; 83 lateral arm flaps for reconstructions of tongue, oral floor, buccal mucosa; 13 anterolateral thigh flaps to reconstruct major soft-tissue defects and to cover orofacial fistulas. The combination of both fibular flap and anterolateral thigh flaps is used in 5 cases to reconstruct mandible-oral floor and to cover

the area after tumor resection. Reconstructive surgery following the resection of maxillomandibular lesion is very important. Excision of large benign tumors and malignant tumors always leaves major defects that cannot be repaired with conventional reconstructive techniques. Free flap reconstruction is a flexible reconstructive option that can overcome the limitation of conventional approach and restore the essential functions and esthetics of the facial area. The implementation of microsurgery technique at NHOS has been carried out for only 12 years but rapid and significant progress has been made.

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Esthetics & function: Practical remarks

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Abstract

The long-term success of prosthetic rehabilitation is related to the proper planning and implementation of restorative therapy. The refined procedure allows for the precise transfer of previous functional and esthetic assumptions in the form of a wax-up directly to the patient's oral cavity through direct reconstruction, based on the injection-flow technique or minimally invasive indirect work. Focus on the correct, stable function of the temporomandibular joints and the details of the morphology of the teeth as well as their mutual relationships in dynamic movements is an important element in understanding the characteristics of reconstructions based on the philosophy of bioesthetic dentistry. The aim of the lecture is to discuss the principles of clinical and laboratory procedures at various stages of treatment.

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Minimizing peri-implant complications through optimal management of the oral microbiome

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He maintains a private practice in Sydney, Australia, where he has used multiple lasers since 2008. He is an educator and international speaker who trains local and overseas dentists in the use of ozone, CBVT and lasers for dental and esthetic treatments. Currently, the Australian Master trainer for Fotona lasers. He has completed Masters in Laser Dentistry from the prestigious Laser Aesthetic & Health Academy in Slovenia. He is currently studying for a Master in Laser Dentistry at the Catholic University of Rome.
He is President of the Australian and New Zealand Study Club of the Academy of Laser Dentistry (ALD) whose aim is to provide access to education and encourage the use of lasers within clinical practices, educational institutions and public clinics. Dr. Pang is the author of the chapter "Innovative Dentistry" in the Amazon best-selling book "Game Changers: Entrepreneurs Leading Change", a book about a group of business owners that are disrupting their industries by doing things differently.

Abstract

Implants can be an excellent alternative to replace lost teeth. However, implants are not without their own problems. Studies show that up to 80% of patients may experience some form of inflammatory peri-implant complications. It is well accepted that a dysbiotic polymicrobial community is responsible for periodontal and peri-implant disease. Oral biomarkers provide information on the inflammatory status of a patient and can be valuable to assess the periodontal risk prior to implant placement. In peri-implant mucositis or peri-implantitis, it is imperative to have biomarkers to determine the long-term prognosis for implant success. Lasers or surgical therapy will remove invasive pathogenic bacteria and antimicrobials such as ozonated water slow down recolonization. Live microscopy of the subgingival biofilm gives us real-time feedback on bacterial load and motility, patient engagement, and an endpoint for antibacterial interventions. Periodic monitoring enables maintenance of a non-inflammatory oral microbiome to minimize peri-implant complications.

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Synergistic treatment with simultaneous use of vacuum therapy and photobiomodulation therapy (PBMT) on temporomandibular disorders (TMD)

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Abstract

Background. Temporomandibular disorder (TMD) is a term used in functional disorders related to the temporomandibular joint (TMJ). This dysfunction refers to a set of disorders characterized by joint noises, limitations in range of motion or deviations in mandibular function. The etiology of TMD is multifactorial.

Objectives. The purpose of this study was to analyze the oral health-related quality of life (OHIP-14) of a patient with TMD who was treated simultaneously with vacuum therapy and photobiomodulation therapy (PBMT).

Materials and methods. The patient diagnosed with TMD according to the DC/TMD was treated with equipment consisting of negative pressure and PBMT in the same system. The oral health-related quality of life (OHRQoL) was evaluated by the Oral Health Impact Profile (OHIP-14) in 3 moments: pre-treatment (T0), after 8 treatment sessions (T1) and 30 days after the end of treatment (T2).

Results. Patients screened according to the DC/TMD with TMD were treated simultaneously with vacuum therapy and PBMT, and an improvement in pain, mouth opening and quality of life was observed.

Conclusions. Combined therapies (PBMT and vacuum therapies) may be a complementary or alternative treatment to control pain and decrease the recovery time of normality masticatory muscles. The beneficial effects persisted and improved the quality of life of this patient.

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Laser photonic energy delivery in clinical dentistry: Scrutiny of parameter variables

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Steven Parker is an Honorary Professor in the Faculty of Health and Life Sciences, De Montfort University, Leicester. He has been involved with lasers in dentistry for over 30 years. He serves as Associate Editor of Lasers in Medical Science. He is Co-Director of the Dental Laser Training Academy, UK. He has published over 75 peer-reviewed papers on the use of lasers in dentistry. From 2010 to 2020 he worked as Contract Professor (Professore a Contratto), Department of Surgical Sciences and Integrated Diagnostics at the University of Genoa, Italy and was International Coordinator and Lead Faculty of the Academic Master Degree (AMD) (Livello II) program in laser dentistry at the University. He served as President of the Academy of Laser Dentistry in 2005–2006. He is co-Editor-in-Chief and co-author of the 2017 Springer textbook "Lasers in Dentistry – Current Concepts", currently under revision as 2nd Edition, 2023. Steven recently completed his PhD in laser photonics at De Montfort University, Leicester, UK.

Abstract

Through evidence-based research and peer-reviewed publication, it is acknowledged that photobiomodulation (PBM) constitutes a significant beneficial contribution to laser-adjunctive therapy. Both ablative (surgical) and sub-ablative photonic irradiation of a chosen coherent wavelength delivers PBM effects, through photochemical, photothermal or photobiological gradients, subject to the nature and concentration of the applied irradiance.

The presentation reviews various photonic gradients of applied laser radiation with extrapolation to the concepts of applied dose to address post-therapy healing and analgesic benefits, relative to the site and anatomical position of target pathology or wound.

With reference to laser delivery applicator size, guidance is offered to assist in the computation of applicable photonic dose in the adjunctive treatment of clinical surgical and benign pathological conditions.

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(Online) Practical aspects of PBM delivery in clinical dentistry

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Abstract

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(Online) An exploration of laser-induced uneventful healing after laser soft tissue surgery with short and long wavelengths, outside the PBM optical window (650–1350 nm)

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Abstract

The range of laser wavelengths, as represented by the extent and range of the so-called "optical window" fails to recognize the use in clinical dentistry of laser wavelengths between 400 nm and 600 nm, or those of wavelengths longer than 1350 nm. Specifically, these include diode lasers (405–532 nm) and Erbium Chromium YSGG (2780 nm), Erbium:YAG (2940 nm), and CO_2 (9300 nm or 10,600 nm).

What remains a compelling benefit of these lasers (as also suggested for those operating within the optical window) in surgical treatment or intervention of oral soft tissue, is the nature of what has been described as "uneventful" healing; the reduction in peri- and postoperative pain, coupled with the apparent suppression of inflammatory changes, has endorsed both anecdotal and published data to suggest such beneficial post-operative conditions. The evidence of such benefits confounds a belief that they are not attributable to photobiomodulation, in that photonic energy may be excessive at short wavelengths and ineffective at longer wavelengths. The presenter has coined the acronym "Q-PBM", i.e., QuasiPBM, to respect the published data, but also to question exactly the mechanism by which laser-mediated soft tissue surgery can deliver the benefits outlined above. Additionally, the use of these shorter and longer wavelengths in providing sub-ablative, non-surgical therapies, raises questions regarding biomodulation that fall outside the "classical" well-known mitochondrial effects.

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(Workshop) Photobiomodulation (PBM) for mucositis management in pediatric oncology: In search of ideal clinical protocol

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Abstract

Treatments in the oral cavity can be performed using the latest Waterlase® laser technology. I would like to introduce you to practical tips and tricks that can be used when working with this laser. We will start by taking a closer look at the use of laser in the so-called "gummy smile", using the latest laser technology with a wavelength of 2780 nm. We can quickly correct the patient's gum smile, because this laser allows for a very precise and bloodless tissue correction procedure, without the risk of damaging the adjacent areas. Waterlase is used to carry out many treatment procedures in an atraumatic way owing to which unexpectedly beneficial effects are obtained both in periodontology, surgery, prosthetics as well as implantology or conservative treatment (we remove only the tissue involved in the carious process, we can also protect the damaged pulp of a healthy tooth or remove badly glued veneer without damaging it). It is an effective and at the same time reliable tool in the treatment of periodontitis, endo-perio and peri-implantitis, significantly increasing the positive healing effects, which I will gladly present during the webinar. I want to show you how you can shorten the patient's stay in the office and increase the percentage of satisfied patients with comfortable treatment that quickly brings desirable results.

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Is laser a piece of must-have equipment in periodontal practice?

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DDS MSc Magdalena Pawelczyk-Madalińska, specialist periodontist, implantologist, International Master of Science Laser Dentistry. Fellowship at World Clinical Laser Institute (WCLI), Oral Implantology with Wolfgang Goethe Universität, Germany. Daily, she deals with modern dentistry, with an emphasis on multidisciplinary treatment using lasers of various wavelengths. She likes working with equipment she is familiar with. She graduated from the Faculty of Dental Laser Therapy at the University of Genoa. Since then, lasers have had no secrets from her. From the beginning of her professional career, she has treated patients in a very holistic way, trying to restore patients' health and self-confidence by saving promising teeth and supplementing them, in the event of loss, by using implants and modern prosthetic solutions. She feels satisfaction when helping patients and restoring their joy in life. For several dozen years, in addition to exploring knowledge in the country and abroad and running a practice, she has shared her skills during practical training and lectures for doctors. She is a co-author of a textbook for hygienists and doctors and didactic films. Currently, she would like to share her knowledge about modern treatment methods. She is a member of World Clinical Laser Institute (WCLI), Polish Society of Laser Dentistry, an active member of the Polish Academy of Aesthetic Dentistry (PASE), International Federation of Esthetic Dentistry (IFED), Implant Masters Poland, Polish Society of Periodontology (PTP), Polish Society of Dentistry (PTS), Polish Association of Implantologists (PSI), and Foundation fighting with the oral cancer: Z Uśmiechem przez Życie.

Abstract

Treatments in the oral cavity can be performed using the latest Waterlase® laser technology. I would like to introduce you to practical tips and tricks that can be used when working with this laser. We will start by taking a closer look at the use of laser in the so-called "gummy smile", using the latest laser technology with a wavelength of 2780 nm. We can quickly correct the patient's gum smile, because this laser allows for a very precise and bloodless tissue correction procedure, without the risk of damaging the adjacent areas. Waterlase is used to carry out many treatment procedures in an atraumatic way owing to which unexpectedly beneficial effects are obtained both in periodontology, surgery, prosthetics as well as implantology or conservative treatment (we remove only the tissue involved in the carious process, we can also protect the damaged pulp of a healthy tooth or remove badly glued veneer without damaging it). It is an effective and at the same time reliable tool in the treatment of periodontitis, endo-perio and peri-implantitis, significantly increasing the positive healing effects, which I will gladly present during the webinar. I want to show you how you can shorten the patient's stay in the office and increase the percentage of satisfied patients with comfortable treatment that quickly brings desirable results.

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Photobiomodulation (PBM) for mucositis management in pediatric oncology: In search of ideal clinical protocol

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Abstract

Background. The Multinational Association of Supportive Care in Cancer and the International Society of Oral Oncology (MASCC/ISSO) as well as the European Society for Medical Oncology (ESMO) recommend photobiomodulation for prevention and treatment of oral mucositis (OM). But the protocols are not yet in place.

Objectives. To protocolize a guideline and apply it to pediatric oncology patients at the Hospital del Niño Jesús through the Aladina Foundation. We hope that our work will be transferred to and benefit other pediatric oncology patients.

Materials and methods. We conducted a pilot study to evaluate the efficacy of photobiomodulation therapy on chemotherapy-induced OM in children. The aim of the study was to describe the effectiveness of PBM and its mechanisms of action for healing the mucositis. The second objective was to establish the advantages of the different wavelengths and the most favorable dosimetry. The last objective was to determine the scientific evidence that endorses the clinical protocol. We conducted a systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The search strategy was prepared by 2 authors. Full-text articles from 3 major databases, namely PubMed, Google Scholar and Cochrane database, published in English between 2008 and 2023 have been searched. The MeSH terms employed were: "Laser PBM" OR "Low Level Laser Therapy" OR "Laser biomodulation" OR "Photobiomodulation" AND "Oral Mucositis" AND "Paediatric Oncology". The eligibility criteria were as follows: study on humans, randomized controlled trials, age of patients: 0–18 years. The exclusion criteria were: in vitro animal studies, opinion or narrative papers, and systematic reviews. A total of 661 papers were retrieved, 7 of which met the inclusion criteria and were analyzed for the purpose of the study. Regarding the effectiveness of the use of LLT or PBM, most of them included adults, other was excluded due to problems with dosimetry.

Results. Only one of the studies reviewed was a multicenter double-blind study with a control group that has been carried out in Italy. The remaining papers present different biases, either because they could not have a true control group, or because of the difficulty of the design to pass the ethics committee. We must also take into account the variability in terms of extraoral and intraoral techniques, laser devices and LEDs.

Conclusions. With respect to the ideal wavelength, all the authors are in agreement that NIR, 633 nm, 720 nm is ideal in LEDs or PBM and 780–810 nm by diode laser, based on Tina Karu's work. The protocol used was more variable, with DE around 4 J/cm^2 and power output of 10–150 mW.

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3D opportunity to see everything

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Born in Croatia in 1986. After completion of the dental technician high school was enrolled to the University of Dentistry in Rijeka, Croatia. Graduated and started working in 2011. In 2015, completed his master's degree in implantology. The owner of a dental clinic since 2021. Most of his work is based on implantology and prosthetics.

Abstract

Lecture with theoretical part and hands-on course on the practical use of cone beam computed tomography (CBCT) and planing in VistaSoft software. It will include anatomical, diagnostic and planing theory as well as explaining benefits of 3D compared to 2D and potential of artificial intelligence in modern software.

Theoretical part. Anatomical theory, diagnosis, treatment planning (implants), comparison of 3D to 2D (TMJ), potential of artificial intelligence in modern software.

Practical part. Diagnostic possibilities with modern 2D/3D software, basics in implant planning, discussion of clinical patient cases.

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The web of collagen: How to make predictable augmentation

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Abstract

Guided bone regeneration (GBR) is a well-documented technique for bone augmentation. It requires a long enough exclusion of unwanted soft tissues from occupying a space where the bone is needed. This secluded space should be maintained for the new bone to mature and become stable with minimal resorption. All this may be achieved by using a barrier that will ideally block cell passage and allow fluids and nutrients to reach and nourish the regenerated tissue. How to choose augmentation materials so that it is the most predictable based on medical publications? What biomaterials, when, what, and how. My tips and tricks.

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Violet LED associated to bleaching agents and the effect over dental enamel

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Abstract

A violet LED device was introduced as a promising alternative to perform dental bleaching, associated or not with bleaching agents under different concentrations. This study evaluated the effect of different dental bleaching protocols by means of Knoop microhardness, mineral content, color changes, and surface morphology. Bovine specimens ($n = 104$, $4 \times 4 \times 2$ mm and $n = 80$, $8 \times 8 \times 2$ mm) were obtained, and after staining in coffee solution one half did not receive the bleaching procedure (control) and the another one received the treatment. Different protocols were tested: G1: HP Maxx; G2: HP Maxx + Twin Flex Evolution; G3: HP Maxx + Bright Max Whitening; G4: 10% hydrogen peroxide; G5: 10% hydrogen peroxide + Bright Max Whitening; G6: 22% carbamide peroxide; G7: 22% carbamide peroxide + Bright Max Whitening, and G8: Bright Max Whitening. The possible changes on the surface (S) and subsurface (SB) by Knoop microhardness, Raman spectroscopy and SEM as well as color changes (S) were evaluated. Statistical analysis was performed using analysis of variance (ANOVA) and Tukey's test at significance level of 5%. A significant effect of the bleaching protocols was observed for the microhardness, mineral content, color changes ($p < 0.05$), and morphology. The absence of the gel can lead to minor changes on the enamel surface after dental bleaching.

Key words: dental bleaching, hydrogen peroxide, dental enamel, LED

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Laser light for the management of peri-implantitis

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Abstract

Peri-implant diseases are associated with multiple etiological factors. Bacterial accumulation on implant surfaces and the surrounding bone, as well as the presence of nanoparticles due to the implant wear at implant placement or maintenance procedures including fretting and corrosion provide the evidence of peri-implant crestal bone loss and potential implant failure. The lecture will give information about the use of modern technologies, such as the use of different laser wavelengths to decontaminate implants and surrounding bone. The management of peri-implantitis using the energy of light and the impact of lasers on the energy level and wettability of implant surfaces will be presented according to the in vitro, pre-clinical and clinical studies. Protocols for the safe use of lasers in the treatment of peri-implantitis will be demonstrated.

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Blue light laser (445-nm) in oral soft tissue surgery

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Abstract

In the last few decades, clinical experience showed different advantages of using a laser device rather than a scalpel during oral soft tissue surgery. This lecture focuses on the possibility of using the 445-nm diode laser (Eltech K-Laser srl, Treviso, Italy) in complete safety, during the surgery of oral soft tissue. The author evaluates the histological effects at microscopy, presenting an ex-vivo study, and the clinical results through the presentation of various clinical cases. He showed that the 445-nm diode laser creates a minimum thermal effect that has no implications on the histological evaluation of benign lesions and that in suspicious lesions, a safety margin of 1 mm, compared with a scalpel, is preferable. He concluded that the blue laser has excellent surgical properties and can manage many arduous clinical cases, such as vascularized lesions.

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(Online) How the prevention of oral cancer has changed?

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Abstract

Oral squamous cell carcinoma (OSCC) represents 90% of lip and oral cancers. The disease is considered the 12th most prevalent cancer worldwide. Lip and oral cancer, as one of the head and neck cancer (HNC) subtypes, is considered the 16th most commonly diagnosed cancer worldwide in both sexes. In 2018, the annual estimated number of incident cases of oral and lip cancer was 354,864 cases worldwide and 3967 cases in Italy. The annual estimated number of deaths due to oral and lip cancer was 177,384 cases worldwide and 1489 cases in Italy. Many risk factors have been linked to oral and lip cancer; such as human papillomavirus infection, local chronic trauma, exposure to ultraviolet radiations, low-antioxidants diet, immunosuppression and oral potentially malignant lesions (OPMLs). Tobacco smoking and alcohol consumption are the most common associated risk factors of OSCC. They are the major risk factors in 74% of cases with OSCC in the western world. Another important aspect to note is the role of HPV as a risk factor. The author presents new perspectives on the prevention of oral cancer through the following points: patient identikit, new classification of OPMLs, new diagnostic techniques, and the use of biomarkers.

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Periodontal and peri-implant diseases: Differentiated laser-assisted surgical and nonsurgical protocols

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Abstract

The surgical treatment of periodontal and peri-implant diseases should always follow nonsurgical therapy and be performed only when initial treatment results are unsatisfactory. Periodontal patient management and modus operandi will be discussed.

Guidance will be provided on differentiated protocols. The use of modified subgingival debridement techniques, state-of-the-art technologies, cause-related laser-assisted nonsurgical periodontal therapy, and novel materials to obtain effective decontamination of the implant surface will be fully illustrated. Innovative materials for a multi-antimicrobial approach will be also reviewed. Specific protocols for mucositis and/or peri-implantitis will be outlined and discussed. The nonsurgical approach has proven effective for mucositis, when adequate home care is combined with mechanical instrumentation, and can sometimes prolong the survival of severely ailing implants. In addition, for patients who may not be able to accept surgical management for any reasons, the dentist must evaluate the potential for a nonsurgical approach to achieve reasonable long-term results.

Clinical cases will be used to demonstrate how patient home care performance can influence the clinical management and outcomes, as well as to document satisfactory clinical stability following periodontal nonsurgical treatment. Although it is often possible to treat periodontal and peri-implant disease, prevention remains the best cure.

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(Online) Periodontal and peri-implant diseases: Differentiated laser-assisted surgical and nonsurgical protocols

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Abstract

A 10-year follow-up clinical case is presented, limited to the right lateral incisor, which at the time of the initial visit had localized and severe periodontal disease.

The case was managed with a non-surgical laser-assisted approach, and after 1 year of follow-up, the clinical results were more than satisfactory, whereas the healing process had not yet fully matured in the preceding months. In the presentation, the emphasis is placed on waiting a congruous period of at least 1 year, in case of initial ≥6 mm pockets, based on the clinical evidence and iconographic documentation of the case.

The site remains stable for about 5 years. Then, at 6-year follow-up, the site shows signs of clinical instability, again managed and solved by a nonsurgical laser-assisted approach. The success of such treatment is maintained for the subsequent years for a total of 10 years follow-up.

Clinical outcomes in the other areas of the same clinical case will be presented during the congress.

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A variety of laser therapies for treating oral lichen planus: State of the art

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Abstract

Oral lichen planus is a persisting oral lesion. The routine treatment of using topical steroids demands the patients' compliance and may not benefit some patients in long term. Laser therapies have been introduced for treating oral lichen planus. Laser surgery for ablating the lesion using 3–4 W CO_2 laser with continuous wave showed remission of reticular type lichen planus or reduced the burning sensation. Photodynamic therapy using 635 nm with 10% 5-aminolevulinic acid provided remission of oral lichen planus without ablative effect. Low-intensity laser therapy either using 800–900 nm or 635–660 nm providing photobiomodulation was an effective therapy for reducing the burning sensation and gaining recovery of erosive type lichen planus. Soft tissue welding technique, using 808 nm or 830 nm, was able to promote healing of erosive type lichen planus with recalcitrant to steroid or low-intensity laser. Based on the relevant studies conducted by the lasers in dentistry research group, Khon Kaen University, laser therapy is considered to be an effective modality for long-term treatment of oral lichen planus. The success of laser therapy for treating oral lichen planus relies on selection techniques and monitoring of the clinical results to refine the modalities.

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Treatment of peri-implantitis using lasers: A current clinical approach

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Prof. Shibli is Director and Head of Oral Implantology Program and Professor, Department of Periodontology and Oral Implantology, Dental Research Division, University of Guarulhos, São Paulo, Brazil. In 2018, he became Vice Dean for Dental Research and Graduate Program. Prof. Shibli received his PhD and Master's degree in Periodontology in 2003 and 2000, respectively, for evaluating peri-implant diseases and microbiology composition of these lesions in both pre-clinical and clinical studies. He also spent a PhD period at Department of Oral Biology, SUNY at Buffalo, NY, USA. His research is focused, but not limited to oral implantology and periodontology, mainly peri-implant diseases, guided bone regeneration, growth factors, implant surface topographies, laser and randomized clinical trials (RCTs).

He is currently a reviewer of the principal peer-reviewed journals in the field, such as International Journal of Oral and Maxillofacial Implants, Clinical Oral Implants Research, Journal of Clinical Periodontology, Journal of Periodontology, Clinical Implant Dentistry and Related Research, Journal of Periodontal Research, PlosOne, Journal of Biomedical Materials Research, Part B: Applied Biomaterials, BioMed Res International, Photomedicine and Laser Surgery. He is part of the Editorial Board of Journal of International Academy of Periodontology, BioMed Res International, Case Reports in Dentistry, and Brazilian Oral Research. Prof. Shibli was ranked at position 20 in the world, based on the number of his publications in the field of oral implantology, according to Tarazona et al. (Clin Oral Implants Res, 2017, doi:10.1111/clr.12891). He has published more than 239 papers indexed in PubMed and 8 textbooks.

Abstract

Nowadays, the use of dental implants to restore partially and totally edentulous subjects is a successful treatment in dentistry. The global market of dental implants was valued at US$ 3 billion in 2016, with more than 9,500,000 implants placed all over the world. However, recent data presented a concern about the scenario where the incidence of peri-implant diseases ranged between 0.4 and 43% after 5 years.

Peri-implantitis is an infectious disease that causes bone loss and, if not treated, could lead to the loss of the implant-supported restoration. The etiology of peri-implantitis is associated with a complex bacterial biofilm and systemic and local risk factors that might increase the severity of the peri-implant tissue destruction.

Intriguingly, there is no specific and predictable treatment for peri-implantitis, although several surgical and non-surgical therapeutic strategies have been proposed to manage this complex multifactorial disease. These strategies can be divided into anti-infective and regenerative techniques, however, the removal of the contaminants and hard deposits at implant surface alters the implant surface topography as well as the oxide layer, avoiding peri-implant bone regeneration and, consequently, the new bone reformation. Physical methods using lasers have been employed in both anti-infective and detoxification techniques in the last decades. Sterilization and cleaning/decontamination of dental implant surfaces by means of high- and low-intensity laser therapy using Er,Cr:YSGG and Er:YAG have been also employed. Laser irradiation not only removes the inflammatory soft tissue present around the peri-implant pocket but also detoxifies the implant surface without damage or even the alteration of the titanium surface neither dental implant morphology, allowing for a better stabilization of the blood clot with or without adding some bone graft materials during the guided bone regeneration (GBR). In addition, photobiomodulation produced as a secondary effect following the Er:YAG laser therapy positively modulates wound healing. This effect is caused by promotion of cell proliferation and differentiation, as well as anti-inflammatory effects, having a pivotal impact on peri-implant tissues.

The present conference will focus on the treatment of peri-implantitis using the Er:YAG laser as well as the effect on the bacterial etiology. In addition, the treatment of soft and hard periodontal tissues will be discussed during the presentation.

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(Workshop) Jak praktycznie wykorzystać nowoczesne rozwiązania w profesjonalnej profilaktyce

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Dyplomowana higienistka stomatologiczna, od 14 lat prowadzi gabinet higieny w Klinice Śmigieł w Katowicach. Absolwentka Medycznego Studium nr 1 w Katowicach na kierunku Higiena Stomatologiczna oraz Wyższa Szkoła Pedagogiczna TWP w Warszawie na kierunku Edukacja Zdrowotna z Rehabilitacją. Aktywna uczestniczka wielu konferencji dot. profilaktyki stomatologicznej w Polsce i za granicą. Master Trener Swiss Dental Academy, współzałożyciel i członek zarządu stowarzyszenia Polska Akademia Profilaktyki Stomatologicznej. Konsultant merytoryczny magazynu Asysta Dentystyczna. Redaktor naczelna magazynu Polskiej Akademii Profilaktyki Stomatologicznej. Wykładowca i szkoleniowiec. Autorka kilkudziesięciu publikacji w branżowych czasopismach, współautorka książki Vademecum Asysty Dentystycznej.

Streszczenie

Świat wokół nas intensywnie się rozwija, powstają coraz to nowocześniejsze urządzenia mające na celu ułatwienie i usprawnienie naszego życia. Innowacje dotyczą również gabinetu higieny stomatologicznej. W trakcie wykładu omówiony zostanie ultranowoczesny protokół zarządzania biofilmem, Guided Biofilm Therapy. Przedstawione zostaną unikatowe technologie dające możliwość dotarcia w najtrudniejsze miejsca, niedostępne w trakcie użytkowania tradycyjnych metod profilaktycznych.

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Guided bone regeneration and connective tissue grafts around implants in the esthetic zone

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He specializes in periodontology, implantology and esthetic dentistry. In 2001, he graduated from medical studies at the Medical University of Lodz. He runs a private practice at the Aquarius Aesthetic Dentistry Center and the Soft Tissue Institute training company in Bełchatów, Lodz Voivodeship. He completed courses in: implantology with Marcus Hurzeler and Dennis Tarnow; periodontology with Giovanni Zucchelli, Otto Zuhr and Rino Burkhardt; bone regeneration in Fouad Khoury, Ueli Grunder, Istvan Urban; prosthetics and occlusion at Dawson Academy (Florida, USA) and with Tomas Linkevicius.

Abstract

The anterior zone of the jaw is extremely demanding in implant treatment. It requires well-established practical knowledge both in the field of bone regeneration and soft tissue management. In the presentation, on the example of clinical cases, proven algorithms were presented: guided bone regeneration (GBR), digital implant positioning with the use of full navigation and connective tissue grafts in order to build volume and reconstruct the keratinized gingival zone.

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Interaction between laser therapy and orofacial harmonization

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Abstract

Background. Laser therapy is a treatment with a therapeutic purpose through the incidence of an electromagnetic beam of laser light with a specific wavelength. Orofacial harmonization is a new specialty of dentistry responsible for the esthetic and functional balance of the face, through different techniques and materials.

Objectives. The aim of the lecture is to show how laser therapy can help in the prognosis of orofacial harmonization procedures through its local and systemic action.

Materials and methods. The concepts of laser therapy will be shown through the presentation of clinical cases performed by the author, in order to illustrate the applicability of the modified ILIB protocol of systemic laser; laser and led biophotonics combined with the action of dermocosmetics for skin treatment; and antimicrobial photodynamic therapy for the treatment of complications that may occur in orofacial harmonization treatment modalities.

Conclusions. The search for esthetic perfection requires technological innovation, materials, and new techniques in pre- and postoperative treatments in orofacial harmonization. In this context, the beneficial effects provided by low-intensity laser therapy on biological tissues are excellently allied with the clinical practice of the specialty.

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(Workshop) Theoretical basis on PBM and pain management

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Abstract

ComfortLase™ – Help your body heal faster and more efficiently in a natural way!
Light has been recognized as a source of energy and healing since the earliest times. Today, light can be used in a controlled and predictive way with medical laser devices. Fotona's ComfortLase is a modern laser therapeutic approach that uses the power of light for photobiomodulation (PBM) and pain management. Photobiomodulation is a biological response to non-thermal, low-level light therapy using visible to near-infrared light to heal a wide range of medical conditions, diseases and injuries. Light photons penetrate the tissue, enter the cell and become absorbed by chromophores. The main chromophore involved in photobiomodulation is cytochrome c oxidase, an active respiratory chain protein in the mitochondria's inner membrane. Mitochondria are cellular powerhouses and their activity can be slowed down due to many medical conditions, diseases and aging. Photobiomodulation therapy stimulates the mitochondrial activity and induces 3 main processes. One is the generation of the cell's source of chemical energy, called adenosine triphosphate (ATP) which plays vital roles in the majority of the cell's biological activities, including metabolic regulation. Secondly, the production of a beneficial amount of reactive oxygen species (ROS), which promotes cellular repair and healing. And thirdly, the release of the vasodilative molecule, nitric oxide (NO), increases blood flow and decreases inflammation. Additionally, the application of near-infrared light activates light-sensitive ion channels in the cell's membrane, upregulating the production of ATP and ROS. All of these activities increase cell differentiation, proliferation and migration, and result in 3 key photobiomodulation outcomes: wound healing, tissue regeneration, and managing inflammation and reducing pain. In addition to non-thermal PBM therapy, ComfortLase Pain Management allows for addressing pain also with thermal heating of the target tissue, reaching and stimulating the larger and deeper fascial areas. Both types of therapy may block the peripheral nerve endings of pain receptors, reduce inflammation, modify the production of neurotransmitters, inhibit motor nerves, or simply improve lymphatic flow. ComfortLase is an effective laser solution for pain due to muscle or ligament strain, low back pain, pain and swelling after surgical procedures, and much more. ComfortLase utilizes MarcCo™ handpieces with exceptional transmission and beam profile homogeneity that enable fast, effective and predictable treatment outcomes.

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Photodynamic effect of butyl toluidine blue on the periodontal treatment

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Abstract

Periodontitis is a chronic multifactorial inflammatory disease associated with dysbiotic plaque that is characterized by progressive destruction of the tooth-supporting apparatus. Non-surgical treatment of scaling and root planing (SRP) is the recommended initial therapy. Despite satisfactory results, limitations of this mechanical therapy and the better understanding of periodontal disease have led to the development of adjuvant methods for SRP. Therefore, the search for adjuvant therapies that do not cause bacterial resistance to replace antibiotics in the treatment of periodontitis is needed. Antimicrobial photodynamic therapy (aPDT) has been studied as a promising adjuvant therapy for controlling bacterial infections. The criteria for successful aPDT require the consideration of light delivery, oxygen availability and photosensitizer (PS) administration. Due to the variety of PSs and different irradiation protocols used in periodontal treatment, comparative studies are needed to clarify and encourage the standardization of these clinical and physical parameters, thus reducing the discrepancy in the results of aPDT in the treatment of periodontitis. Butyl toluidine blue (BuTB) was developed by physicochemical modifications of the molecular structure of the established phenothiazine dye toluidine blue O. The current presentation will demonstrate the in vivo (animals and humans) effects of the PS BuTB on the treatment of periodontitis.

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Effect of 808-nm diode laser photobiomodulation in healing acceleration after bone regeneration with/without implant placement

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President of the European Division of WFLD

Abstract

Background. The long-term success of dental implants mainly depends on their osseointegration but at the same time is related to the nearly bone stage formation. The effects of photobiomodulation (PBM) on implants have been explored with regard to both the connective tissue cells and cells mediating osseointegration. The lecture will be divided into 2 parts: the in vivo animal study and the human clinical retrospective study on socket preservation with/without implant placement.

Materials and methods. The aim of the animal study was to evaluate the capability of optical coherence tomography (OCT) imaging instrument to analyze the increase in the quantity of newly-formed bone, using 808-nm diode laser PBM. Bone formation is quantitatively assessed in 5-mm diameter defects created in the calvaria part of the skull of living rats. Samples are divided into 3 groups: A. a negative control group (natural healing process of the defect); B. a positive control group (bovine graft was used); C. a study group (bovine graft and PBM 808-nm diode laser, 2 J/cm^2/point; laser dose of 18.9 J is applied throughout the entire healing period). Photobiomodulation has been performed every 48 h until the animals were sacrificed (after 14, 21 and 30 days), and the samples have been imaged using the multimodal CMS/SS – OCT instrument. In the human clinical retrospective study on socket preservation with/without implant placement, 46 healthy subjects were included in the study. The patients were divided into 2 groups: group 1 received bone augmentation with/without implant placement and group 2 received bone grafting and PBM with/without implant placement. The laser irradiation was performed on the side of the extraction, and the contralateral side was used as control. A 808-nm diode laser was used in contact mode with 2J/cm^2/point (laser dose of 56.775.6 J/site). A cone beam computed tomography (CBCT) density measurement software was used in order to determine the quality of the newly formed bone.

Results. In the animal study, the method allows for the simultaneous monitoring of the bone tissue via 2 perpendicular cross-sections and 9 en-face images taken at adjustable depths into the sample. A global image with course axial resolution allows for the positioning of the field-of-view of the system on the area of interest on the tissue. The quantitative assessment of bone formation is completed using brightness thresholds for different types of bone (native, bovine bone graft, newly-formed bone). In the clinical part, the CBCT evaluation showed a statistically significant increase in new bone formation of PBM group compared to the control group ($p < 0.05$).

Conclusions. Theanimal and human studies demonstrate quantitatively and qualitatively the positive impact of PBM on bone regeneration.

Key words: photobiomodulation 808 nm, bone graft, OCT, implant, CBCT

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(Online) Evaluation of photobiomodulation in salivary production of patients with hyposalivation induced by antihypertensive drug

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Abstract

Background. Arterial hypertension is a systemic condition that affects approx. 35% of the world population. The drugs that are used for its control can produce hyposalivation and have the potential to induce xerostomia. Xerostomia causes discomfort to the patient, interfering with phonation, chewing, starch digestion (ptyalin and salivary amylase), formation of the bolus, swallowing, dysphagia, dysgeusia, difficulty in adapting total and partial removable dentures, caries index (buffer capacity) and periodontal disease (immunoglobulin protection and self-cleaning), besides being a risk factor for bad breath and oral burning syndrome. In this research, we demonstrate the effect of photobiomodulation on the salivary flow of patients who are using antihypertensive drugs.

Materials and methods. Forty subjects were randomly allocated in one of the 2 groups: control (placebo) and photobiomodulation. The subjects had their salivary glands (20 sites) irradiated with a laser emitting at 808 nm, 4 J/site once a week for 4 weeks and had their salivary flow measured before and after the whole treatment.

Results. The intragroup analysis (before and after treatment) shows a significant difference for both non-stimulated and stimulated salivary flow in the photobiomodulation group ($p = 0.0007$ and $p = 0.0001$, respectively). Comparing the control group with the photobiomodulation group, significant differences were found for both non-stimulated ($p = 0.0441$) and stimulated salivary flow ($p = 0.0441$) after the treatment.

Conclusions. This clinical trial showed that photobiomodulation is capable of significantly increasing the salivary flow of patients who are using antihypertensive drugs.

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Dental implants, bisphosphonates and other antiresorptive drugs and laser

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Abstract

In June 2014, the Special Committee of the American Association of Oral and Maxillofacial Surgeons (AAOMS) recommended changing the nomenclature of bisphosphonate-related osteonecrosis of the jaw (BRONJ) to medication-related osteonecrosis of the jaw (MRONJ). This decision was taken to accommodate the growing number of osteonecroses associated with drugs other than bisphosphonates (BP), such as antiresorptive (denosumab) and antiangiogenic therapies (tyrosine kinase inhibitors: sunitinib/sorafenib, monoclonal antibodies targeting vascular epithelial growth factor (VEGF): bevacizumab).

Dentoalveolar surgery including tooth extractions and dental implants placement is considered the major risk factor for developing MRONJ.

A careful evaluation is required when planning dental implant surgery in patients undergoing bisphosphonate therapy due to the risk of developing MRONJ as well as failure of implant. Moreover, complete systemic condition of the patient must be taken into consideration when such procedures are performed. However, not only surgical insertion of dental implants is a potential risk factor for the development of osteonecrosis but also the presence of the implant into the bone can be associated with this disease. Therefore, it is necessary to inform the patients who already have osteointegrated implants and are going to start the BPT about the increased risk for MRONJ. For cancer patients, the implant solution should be avoided due to the high risk of osteonecrosis. The literature defines a low risk for patients on bone antiresorptive therapy for osteometabolic diseases. In these patients, prosthetic implant therapy is permitted.

Lasers reduce the risk of osteonecrosis and can be used for surgical and non-surgical management of dental implants in cancer and non-cancer patients under antiresorptive/antiangiogenic drugs. The positive effects of different laser wavelengths, both in vivo and in vitro, have been extensively demonstrated and these findings led several authors, in bone diseases, including osteonecrosis of the jaw.

The use of laser photobiomodulation (Nd:YAG, diode) or laser surgery (erbium laser), possibly combined with biomaterials or blood-derived growth factors, is indicated during implant placement, peri-implantitis management, implants removal. Strict laser-assisted periodontal control is indicated for all patients, oncological or non-oncological, who have also received implant-supported prostheses in the past, to prevent the onset of osteonecrosis.

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(Online) Laser management of early oral cancer

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Abstract

The diagnostic pathway for oral potentially malignant disorders (OPMD) usually starts with the conventional objective examination (COE), based on inspection and palpation of the oral mucosa with the support of an incandescent light available on the dental chair. It is well known that clinical examination mainly depends on a subjective interpretation, which is a consequence of the experience of the operator. Moreover, oral epithelial dysplasia and early oral squamous cell carcinoma (OSCC) may already be present within areas of oral mucosa macroscopically normal, as well as within the context of OPMD such as leukoplakia, erythroplakia, submucous fibrosis, and oral lichen planus. A large number of OPMD, regardless of its clinical appearance, contain a dysplastic component, and a significant proportion contains carcinomatous foci. Prompt detection of precancerous and early cancerous lesions could greatly reduce both the mortality and morbidity of oral cancer. Oral squamous cell carcinoma is the most common malignant tumor in the oral cavity and OPMD are responsible for more than 50% of oral cancer. The usual delayed diagnosis and treatment of both, early cancer and pre-cancerous lesions, explains the poor prognostic of OSCC. The development of local recurrence, regional failure, and the formation of second primary tumors induce a 5-year survival rate of about 55%.
The gold standard for the diagnosis of oral dysplastic and neoplastic malignant lesions is the histological examination. Incisional or excisional biopsy techniques are the most reliable methods to collect a surgical specimen suitable for microscopic evaluation. Several adjunctive diagnostic techniques have been proposed in order to increase the sensitivity (SE) and specificity (SP) of conventional oral examination and to improve the diagnostic first level accuracy. Different laser wavelengths offer a prospective new approach in the early diagnosis and treatment of OSCC at its various stages either as a standalone therapy for early lesions or as an adjuvant therapy for advanced cases. Wavelengths of 410–460 nm are used to examine at-risk oral lesions. Autofluorescence (AF) uses natural fluorophores which are located within the epithelium and the submucosa and which are excited when irradiated with specific wavelengths. Following such irradiation, normal, unaltered mucosa emits a pale green AF light when viewed through a selective, narrow-band filter. Areas of reduced AF (dark areas), but also increased AF (brighten areas), are suspicious for epithelial dysplasia or OSCC. A systematic review of the literature reported that the mean SE and SP for oral dysplasia detection with AF were 72.4% and 63.79%, respectively. This technique represents a non-invasive approach designed to visualize early mucosal changes using the principles of tissue AF. Some premalignant lesions showed clinically indefinite extensions. It is possible that relapses and possible malignant evolution may be associated with incomplete excision of the lesion due to anatomical and morphological features of the oral mucosa in various topographical areas. Furthermore, the AF represents an important help to evaluate the extent of the lesions beyond their visible margins. It seems of paramount importance to highlight here that benign lesions, or those associated to inflammation, can also be characterized by a loss of stromal AF. The adjunctive application of different wavelengths (Nd:YAG, Er:YAG, diode, CO_2 lasers) in the surgical approach of early OSCC show many advantages: bleeding reduction, decrease of operative time. Lasers might therefore help improve the postoperative course and reduce the risk of relapses of the disease.

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Full arch removable bridge: From alternative treatment to predictable and esthetic solution

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Abstract

Background. Different clinical approaches of connection between full arch restorations and implants can be applied. The restoration can either be removable or fixed to the implants. Screw-retained bridges are most commonly utilized for full arch rehabilitation cases, where satisfying esthetic outcome and passive fit with retrievability of the restoration are achieved. However, the factors which have the influence on peri-implantitis, especially smoking and poor oral hygiene do not have beneficial impact on fixed restorations.

Objectives. The author compares advantages and disadvantages of fixed and removable full arch restorations reviewing current literature and presenting his own experience. Biological aspects influencing the design of reconstructions are discussed. Solutions for predictable and esthetic removable restoration, applying new material types, are shown.

Materials and methods. Computer-aided design (CAD)/computer-aided manufacturing (CAM) techniques together with new materials enable manufacturing of esthetic, light and unique passively fitted removable restorations. The CAD/CAM titanium telescopic crowns or individually milled zirconia bars were utilized as fixed parts supported on implants. The PEEK hybrid bridge finished with ceramic e.max® or hybrid Enamic® crowns were prepared as removable part. The author presents algorithm to develop functional removable restorations.

Results. The CAD/CAM technology enables manufacturing of implant-supported restorations, which provide both optimal function and esthetics, simultaneously reducing the influence of risk factors responsible for peri-implantitis.

Conclusions. Full mouth implant rehabilitation with removable restorations should be taken into consideration, especially in groups of patients with peri-implantitis risk factors as well as elderly patients. Perfect access to the restoration overcomes biological problems and provides long lasting final outcome. When using fixed, screw retained bridges, there is a debate to splint the implants in one bridge or separate them in two or three parts.

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(Online) Solutions to avoid biological and technical complications in implant prosthodontic reconstructions

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Abstract

The risk of biological, mechanical and esthetic complications has been arising with the number of implants placed every year. The restorative connection to the implant can either be accomplished by screwing or cementing the restoration on standardized or customized abutment. Full arch reconstructions can either be fixed or removable due to patient needs. Cement-retained prostheses are commonly used to restore single unit restorations and bridges, however there are reasonable disadvantages of that connection type. Booth material used to restore the missing teeth and a type of retention, together with shape and volume of gingiva can have a big influence for long-term success of the reconstruction.

Mechanical complications can occur due to implant design, connection and materials used to manufacture a reconstruction.

The author reviews safe pathways to support single and multiple unit restorations reviewing current literature and presenting his own experience. Both biological and technical aspects influencing the design of reconstructions are discussed.

Avoiding complications is the first part of planning the case, which finally provides predictable outcomes. New algorithms in 3D planning, navigated placing of implants, together with CAD/CAM technology, using biocompatible materials can help clinicians to deliver esthetic and safe reconstructions.

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(Online) Photobiomodulation therapy in the treatment of oral mucositis: A clinical case series

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Abstract

Background. Mucositis refers to mucosal damage secondary to cancer therapy occurring in the oral cavity, and can be caused by chemotherapy and/or radiation therapy. Acute complications include mucosal lesions, pain, dysphagia, infections, salivary changes, dysgeusia, and dermatitis, and common chronic complications include hyposalivation, mucosal infections, mucosal atrophy, neuropathies, tooth demineralization and rampant caries, soft tissue and/or bone necrosis, trismus, lymphedema, dermatitis, and voice and speech alterations. These oral complications are associated with a high possibility of a negative impact not only on the quality of life (QoL) but also on the patient's compliance to therapy and the clinical outcomes; thus, it is important to prevent and treat these complications.

Objectives. The aim of this case series was to assess the efficacy of photobiomodulation (PBM) therapy with a specific protocol that was suggested by a multinational panel of experts in the field of PBM and supportive care in cancer patients in the treatment of oral mucositis (OM). The lecture will present 3 clinical cases of patients with OM located on the tongue, palatal arch and labial commissure or on labial and buccal skin, which have been irradiated with the 635-nm diode laser therapy algorithm (PBM), in accordance with Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO) guidelines.

Conclusions. The PBM protocol recommended by MASCC/ISOO seems to be helpful as an additional method not only in prophylaxis but also in the treatment of symptoms of OM and its complications such as dermatitis, pain, xerostomia, and lymphedema.

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(Online) Dental bleaching with violet LEDs based on scientific evidence: Clinical case report

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Abstract

Dental bleaching has become increasingly popular in recent years, and violet LEDs have emerged as a promising tool for achieving optimal results. However, the success of this technique depends on the dentist's knowledge and expertise. This study examines the current state of knowledge on dental bleaching with violet LEDs among dentists and correlates the impact of knowledge on the success of clinical practice. We included a literature review and case studies of patients who underwent dental bleaching with violet LEDs. Dentists with a strong knowledge base on this technique are more likely to achieve successful outcomes. Therefore, it is crucial for dentists to stay up to date with the latest research and advancements in dental bleaching with violet LEDs to improve their clinical practice and provide optimal care for their patients.

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(Online) The use of Er:YAG laser in dental practice: Clinical cases

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Abstract

Objectives. The aim of this presentation is to demonstrate, based upon scientific evidence, the efficacy of dental treatment using the Er:YAG laser. The literature cites various benefits of this technique for dental procedures, with the advantages of effects and of quick cavitation of dental structure, with minimal thermal effect.

Materials and methods. This paper reports the clinical cases with the innovative technology of Er:YAG, (Lite Touch Laser – Light Instruments, Israel).

Discussion. The new features of this equipment is acting in both soft and hard tissue dental treatments. The Er:YAG is highly absorbed in water and hydroxyapatite, can remove dental caries and resin in a non-contact mode, without any vibration. The erbium wavelengths coincide with the absorption peak of water and hydroxyapatite causing removal of hard dental tissue by micro-explosions. Caries tissues contain even more water compared to healthy hard tissues and therefore the high absorption of the Er:YAG laser provides a selective caries removal without extending the preparation into sound tooth structure. This is possible because the Er:YAG laser has several energy levels (mJ) and frequency (Hz) that are selected according to the needs of each case. In the soft tissues, fast and efficient cutting was observed, easy in the removal of gingival hyperplasia and gingival contouring and decontamination of tissues. This presentation shows clinical cases with the Er:YAG laser in hemolasertherapy, gingival plastic surgery, peri-implantitis, and cavity preparation as well as the parameters used in these treatments. The other clinical uses are for the removal of porcelain restorations offer an alternative to high-speed handpieces, avoiding iatrogenic damage to the underlying dental structure. It can be used to efficiently, safely and predictably remove all porcelain restorations while also keeping them in one piece. If the restoration can be removed, reused and rebounded with minor alterations, it can save time and costs for all parties involved. These veneers do not fracture during the removal process, because they present higher flexural strength of E.max (lithium disilicates resist the pressure buildup between the tooth and the veneer during the explosive ablation of the cement) (Morford et al. Lasers in Surgery and Medicine. 2011:43:965–974).

Conclusions. Dental treatment with the Er:YAG laser was a secure and efficient method of treatment providing more comfort and security for the patients.

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Laser in health science

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Abstract

Coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has brought new challenges to dental practice. Although elective procedures should not be performed during this time, urgency and future treatment guidelines must be established for safe management of dental patients and protection of the professional staff.

High power lasers (HPLs) are used to perform soft tissue surgery and other dental procedures such as caries removal, root decontamination and bone surgery. Some of these lasers, Er,Cr:YSGG, Er:YAG and CO_2 use an air-water spray as a cooling system, which may certainly produce aerosols. Other HPLs such as diode lasers, Nd:YAG and CO_2 do not have a water cooling system and are used mainly in soft tissue surgery and dental decontamination. The interaction of these lasers with biologic tissues produces surgical smoke capable of carrying virus particles, such as human immunodeficiency virus (HIV) and human papillomavirus (HPV). Dentists should be aware of safety rules and other procedures that can diminish the possibility of contamination during aerosol generation. Furthermore, dentists should prefer laser systems used with disposable optic fiber tips whenever possible.

This presentation will discuss the latest developments in the field of lasers in this pandemic period after a brief citation history of WFLD.

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Importance of heat generation and propagation on dental tissues due to high-intensity laser irradiation for safe clinical use

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Abstract

Erbium lasers are strongly absorbed by water and hydroxyapatite, which are the main components of hard tissues (enamel, dentin and bone). Consequently, these lasers can be efficiently used for cutting hard tissue, for cavity preparation, for caries removal, caries and erosion prevention, when laser irradiation should change chemically the structure of dental hard tissue in order to increase their resistance to demineralization. More recently, erbium lasers are being used for debonding ceramics. Only using proper irradiation conditions, minimally invasive procedures with low thermal or mechanic damages to the tissues can be achieved. For these applications, erbium lasers can increase the temperature up to 1200°C on dentin and enamel surface, and the thermal effects must be controlled to avoid thermal damages, such as carbonization and cracks that can weaken the irradiated tissue or even damage the pulp or periodontal tissue. Therefore, it is strongly required to know the thermal effects of laser irradiation on target tissues, which depend on the laser parameters and refrigeration methods. Studies regarding superficial thermal changes promoted by the Er,Cr:YSGG laser irradiation on enamel will be described, according to the experimental measurements performed by infrared thermography. Fast-response thermocouples were also used to determine the temperature increase inside the pulp chamber and at periodontal tissue during laser irradiation simulating a clinical protocol. These studies were useful for determining laser energy densities and time of irradiation. The characteristics of laser irradiation, such as wavelength, laser absorption and optical properties of enamel were strictly considered. These studies demonstrate the strong effects of a higher-absorbed laser wavelength on biological tissues and how the practitioners can avoid possible thermal damages due to laser irradiation. The knowledge of optical changes on biological tissues due to heat is also an important point to be considered for determining laser parameters in a future clinical practice.

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From function to esthetics: All in direct composites

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Dr. Maciej Żarow graduated from Semmelweis University in Budapest in 1995. After a three-year training program, he achieved specialization in operative dentistry in 1999. From 1998 until 2005 he was teaching at the Jagiellonian University in Cracow. There, in 2002, he defended his PhD and, in 2005, he achieved specialization in endodontics. He is also the co-author of more than 100 papers published in Polish and international journals. Dr. Żarow is the author of a book titled EndoProsthodontics: Guidelines for Clinical Practice, published by Quintessence Publishing (in Polish, Russian, English, French, Croatian, and Chinese). In the years 2012–2016, he has been Editor-in-Chief of the dental journal Medycyna Praktyczna – Stomatologia, and since 2020, Editor-in-Chief of Quintessence for the dentists (Polish edition). An active member of the Polish Academy of Aesthetic Dentistry, ESCD, and International College of Dentists. Dr. Żarow has lectured extensively in Poland and other European countries. He was a Visiting Professor of University in Chieti (Italy) 2015–2016, lecturer for postgraduate master programs at UIC in Barcelona (since 2012). He is an honorary member of Style Italiano. He has run a private dental clinic since 1999 and a postgraduate course center, since 2003, in Cracow, Poland.

Abstract

Direct composite restorations are well known yet now, they become a new, separate discipline in restorative dentistry, as they are more and more predictable, and thanks to better adhesion and mechanical properties, new indications are found. It is commonly known that composite restorations are esthetic and indicated for anteriors. More and more dentists understand that the composites are alternatives for the ceramics in case of veneers. However, recently, the new techniques have been introduced in order to obtain full occlusal rehabilitation in direct composite resin. What are the indications? How to proceed? What are the risks and benefits of the technique? These questions will be highlighted and discussed during the lecture.

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(Online) The Dentroid Concept for hands-free femtosecond enabled intra-oral device

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Emeritus Professor Walsh is one of the most prominent dental clinicians, scientists and innovators in the southern hemisphere. He has published more than 340 papers, authored over 22 book chapters or books and registered over 20 patents. From 2000 to 2020 Prof. Walsh led the Advanced Technologies group at the University of Queensland School of Dentistry. He is a founding member (2010) and the current president of the Australian Association for Laser Dentistry, as well as a founding member (1992) of the US-based Academy of Laser Dentistry. He has had significant past industry collaboration with dental laser manufacturers, including Denfotex (UK), Biolase, Ultradent and Luxar/Laser Light Scalpel (USA), HighTech Laser (Belgium), and KaVo (Germany).

Abstract

Dentroid is a Canberra, Australia based startup founded in 2017. Their patented technology aims to develop a miniature intra-oral robotic device that clamps directly onto the target tooth, and is operable by the dentist using the control panel. The device uses femtosecond lasers to induce cold ablation, thus providing a dental treatment that is ultra-precise, rapid and without drills, irrigation or vibrations.

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Effect of systemic photobiomodulation on orofacial pain in individuals post-COVID-19: A case series

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Abstract

Orofacial pain is one of the symptoms reported in individuals who have contracted coronavirus disease 2019 (COVID-19), even after recovery, and is considered chronic pain in these cases. The control of the painful sensation is carried out, for the most part, through analgesic and anti-inflammatory drugs. However, adjuvant treatments that can decrease the amount of drug intake and improve the quality of life of compromised individuals are available, one of which is photobiomodulation. With the use of laser, successful treatments are performed to control inflammation and pain, but the parameters and methods of application are not yet firmly established. The aim of this research is to report a case series of patients with post-COVID-19 orofacial pain treated with systemic photobiomodulation. For this purpose, 11 patients with post-COVID-19 headache for more than 3 months who met the inclusion criteria were selected and received systemic photobiomodulation with red laser with transcutaneous application in the radial artery (660 nm, 100 mW, 30 min). The treatment period was 4 weeks, totaling 4 application sessions. Effects were measured using the validated visual analog scale (VAS). Data were collected weekly before and after treatment and analysis of variance (ANOVA), Tukey's paired t-test, Kruskal -Wallis or Wilcoxon tests were applied, depending on data distribution. The level of statistical significance considered was $\alpha = 0.05$. There was a decrease in the pain scale in the 4 sessions. However, there was a statistically significant difference only in the 2nd and 3rd sessions ($p < 0.05$). When comparing the mean pain scale (VAS) in the first consultation, it was possible to observe that there was a decrease from 2.73 to 0.67, with a statistical difference between the 2 measures ($p = 0.0073$). The benefit of systemic photobiomodulation in pain control was verified and the need for further studies to observe the applicability of this resource and the definition of clinical protocols that demonstrate its viability in the clinical routine were confirmed. CAPES: 0712022.

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Does laser excision permit the reduction of the recurrence rate of HPV-related oral lesions? A systematic review

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Abstract

Objectives. The aim of this systematic review is to evaluate the recurrence rate (RR) of human papillomavirus (HPV)-related oral lesions after the different laser excision in comparison to the scalpel excision.

Materials and methods. We used the standard methodological procedures expected by PubMed, Web of Science and Scopus, and used the keywords (papillomavirus OR HPV OR papilloma, laser, AND oral OR oral lesion) to search for retrospective literature studies. The primary outcomes were the type the excision and its RR. Our secondary outcomes included laser wavelengths, parameters and method of excision. The confidence interval (CI) was calculated for the percentage of the RR of the oral HPV-related lesions in an Excel file on the assumption of binomial distribution of a random variable with the probability of error $p < 0.05$. Application of the binomial law with the definition of CI accurately minimizes the error and allows an accurate display of the result of the study. Inclusion criteria are the articles accessible in the full-text form of studies published over the past 5 years in English. The study included the laser excision of oral HPV-related lesions; the scalpel excision was used as the control group.

Results. The search criteria were analyzed in 3 retrospective studies and included 579 patients to evaluate the RR of oral HPV-related lesions after excision at the follow-up timeline from 14 to 18 months. The range of the RR after a surgical scalpel excision (CG, n = 332): 1–10%; by a 10,600-nm laser (G1, n = 115): 1–18.2%; by a 1064-nm laser (G2, n = 65): 0–2%; by a 980-nm laser (G3, n = 64): 1.4%, by a 2780-nm laser (G4, n = 3): 0%. The CI, which is required in clinical studies to evaluate the results of treatments, demonstrates no significant differences between the study groups and the control group. The laser wavelengths which are applied in these studies correspond to the infrared part of the electromagnetic spectrum, so the authors considered it appropriate to compare the effect of lasers in general G1–G4 (n = 247) – 1.5% (CI: 0.6–4.2%) with a surgical scalpel CG (n = 332) - 2.7% (CI: 1.5–6.0%).

Conclusions. This systematic review within the limits established by the adopted inclusion criteria demonstrates no significant differences in the choice of laser excision in comparison to the scalpel excision in the evaluation of the RR of HPV-related oral lesions based on the analysis of CIs.

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The magic of laser in treating nerve injury and other daily cases: Is it worth it?

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Abstract

Background. Laser has been improving to be used in various procedures in our everyday practice from soft tissue to hard tissue management. Erbium and diode lasers have been increasingly used in oral procedures among clinicians due to their advantages, such as the absence of postoperative bleeding, reduction of post-operative edema and pain, rapid mucosal healing, and comfortable cavity preparations.

Materials and methods. Various procedures were performed using both diode 940 nm and Er,Cr:YSGG 2780 nm. Cavity was prepared, gingiva was contoured, pigments and operculum were removed using Erbium, Chromium:YSGG with different handpieces. A 445-nm laser was also used in operculectomy. A 660-nm laser is used for biostimulation of nerve injury.

Results. All cutting procedures, such as operculectomy and gingivoplasty using diode lasers were performed without bleeding or edema and with minimal postoperative pain. Depigmentation using Er,Cr:YSGG 2780 nm was performed without anesthesia and also without bleeding or pain. The 660-nm laser had successfully sped the healing of nerve injury, but a complete healing was not noticed.

Conclusions. Laser biostimulation has the capability of accelerating the healing of nerve injuries. The use of diode and erbium lasers increases patients' satisfaction.

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Assessment of harmless irradiation conditions of diode laser (980 nm) and blue laser (470 nm) on deep cavities: An ex-vivo study

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Abstract

Background. There is a lack of literature concerning the optimal and harmless irradiation conditions of diode laser (980 nm) and the blue laser (470 nm) on deep cavities. In order to avoid the pulp exposition in deep cavities, laser beam needs to be used to vaporize the rest of decay and to decontaminate dentin.

Objectives. The purpose of this study is to find the safe irradiation conditions for these two wavelengths, allowing the caries vaporization in deep cavities.

Materials and methods. The root portions of extracted human maxillary and mandibular premolars (free of caries) were sectioned transversally, at approx. 2 mm below the cementoenamel junction. In all teeth, occlusal cavities were prepared to obtain a thickness of the dentin between the cavity bottom and the pulp chamber roof of ±0.5 mm. The apical access of pulp chamber was slightly widened and filled by a special thermal conductor paste, having the similar thermal conductivity to the human soft tissue. The thermocouple probe was inserted into the close contact with the cameral chamber roof. The average temperature increase was calculated with relation to several irradiation conditions.

Results. The optimal and safe irradiation conditions were selected for each wavelength.

Conclusions. These irradiation conditions may be considered reliable for any future clinical applications in vivo.

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Osteotomy with Er:YAG laser: A stereomicroscopic evaluation on an ex-vivo model

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Abstract

Background. Technological innovations in the optical field are increasingly frequent in the medicine, particularly in dentistry. In the last decade, lasers have assumed a prominent role in oral surgery, both mucosal and bone surgery, offering considerable advantages for the operator as well as for the patient.

Objectives. The aims of the present work are: 1) To report results of a literature review, designed to answer the question: "which osteotomy technique, between Er:YAG laser, piezo-surgery and surgical bur causes less thermal damage and less temperature increase?"; 2) To report results of an ex vivo experiment to assess the best osteotomy technique, causing less thermal injury, less bone debris, leading to a faster and efficient healing, comparing surgical bur and Er:YAG laser.

Materials and methods. The review was performed through a literature search of the Medline database, using the following MeSH terms: "Osteotomy and Er:YAG ", "Osteotomy and laser", "Osteotomy and piezosurgery", "Osteotomy and surgical bur", "Bone heat and Er:YAG", "Bone heat and laser", "Bone heat and piezosurgery", "Bone heat and surgical bur". Studies in English, published after 2010, analyzing osteotomy with different techniques, on human or animal models and evaluating temperature increase or thermal damage were included. Studies analyzing implant site preparation and soft tissue surgery were excluded, as well as personal communications, letters to the editor, reviews, and conference proceedings.
In the pilot study, 15 blocks of porcine bone were created, divided into 3 groups and sectioned into 2 parts using different techniques: a) surgical bur mounted on a straight handpiece at 40,000 rpm; b) erbium laser in MSP mode, energy: 250 mJ, frequency: 20 Hz, water level 4 and air level 6, obtaining a total of 5 W of power; c) erbium laser in QSP mode, energy: 330 mJ, frequency: 15 Hz and the same level of water and air, respectively 4 and 6, obtaining a total of 4.95 W of power. Section times have been recorded. The cut surfaces were observed under a stereomicroscope and analyzed with a colorimetric program, highlighting areas with bone tissue debris.

Results. Six out of 2275 articles met the inclusion and exclusion criteria. Extrapolation of data from selected articles confirmed that the Er:YAG laser and piezo surgery cause no thermal damage, while surgical bur causes minimal thermal damage. The analysis of time required to perform osteotomies has shown that the bur is the fastest tool to cut with. However, the analysis of the cut surfaces highlighted the presence of a large amount of smear layer and bone debris in the cuts performed with the surgical bur, both in the cortical and trabecular bone areas. In MSP mode laser cuts, there is no debris or smear layer in the cortical area, and the trabecular lacunae are empty and clean. The QSP mode showed better results than MSP.

Conclusions. The studies selected in the review are few, and there is no scientific evidence to confirm that the erbium laser is the best tool to perform osteotomies. The experiment shows the superior capabilities of the erbium laser in terms of cutting precision and cleanliness, with consequent positive effects on healing. However, cutting time records show that the laser requires more time to perform osteotomies.

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Non-surgical treatment of infra-bony periodontal pockets using 470-nm blue laser

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Abstract

Background. The laser is a qualitative tool used in addition to a classic treatment (scaling and root planing (SRP)).

Objectives. The aim of our study is to assess the efficiency of blue laser (470 nm) in non-surgical treatment of infra-bony pockets and to evaluate the safety of our irradiation conditions on pulp vitality.

Materials and methods. We have adapted the protocol developed by Nammour et al.'s (2021). We decided not to use hydrogen peroxide irrigation in the pocket because it whitens the inner pocket epithelium and neutralizes the blue laser de-epithelization ability. The remaining part of the initial protocol has been preserved, with the inner and outer de-epithelialization of the pocket, activated pocket bleeding and stabilized blood clot in order to create a natural pack with high healing power. The first stage of our study was to compare ex vivo the temperature rise in 4 irradiation conditions (30 and 60 s irradiation time, water, or red dye in the periodontal pocket): using red dye, temperature increase at 30 and 60 s remains lower than the trigger temperature for the pulp vitality. The second stage of our research was to verify whether the blue laser is effective in non-surgical treatment of deep infra-bony pockets (5 mm). We included patients with localized periodontitis having the presence of 2 bony walls. We excluded patients with systemic diseases, pocket with horizontal bone without walls, pregnancy, smokers (5 cigarettes/day), tooth mobility, furcation involvement or poor plaque control by lack of motivation. After a good instruction to an optimal oral hygiene, the treatment procedure was SRP, de-epithelialization of the inner and outer sides of each pocket mucosa by blue laser, bleeding activation by a curette to fill the pocket with blood, coagulation, and stabilization of the blood clot with the laser. We advised patients to avoid strong brushing, rinsing or mouth washing during the first 24 h. If necessary, we prescribed anti-inflammatory drugs, pain killers and oral disinfection solution.

Results. From a clinical point of view, a significant improvement in periodontal parameters (bleeding on probing, gingival recession and pocket depth) was observed at 6 and 16 postoperative weeks. However, the high laser absorption by blood makes the stabilization of the blood clot more difficult.

Conclusions. The use of blue laser can be considered as an adjunct to SRP in the treatment of infra-bony periodontal pockets. It increases the improvement of clinical periodontal parameters.

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Use of low-power red led associated with the treatment of polydioxanone threads in the glabellar region: A clinical, randomized, controlled, double-blind study

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Abstract

Physical appearance is a factor that contributes to an individual's self-esteem. Maintaining a healthy appearance is a growing quest by the population, and aging is the main cause of discomfort for men and women. There are several esthetic treatments capable of mitigating or delaying the effects of aging in all its layers of alteration (dermis, hypodermis, musculature and bone), and the combination of therapies has been increasingly proposed in search of a positive synergy. The dermal application of polydioxanone threads (PDO) and the low-power red LED are individual options of resources, for which there already are reports in the literature regarding their mechanisms of action in the proliferation of fibroblasts and collagen production. However, the joint application of these techniques requires further studies. The present work aims to investigate the effects of the association of dermal application of polydioxanone threads and low-power red LED in individuals with static wrinkles in the glabellar region. Participants of both genders, aged between 30 and 60 years, who are classified as levels 3 and 4 in the classification of aging according to Glogau, and who have static glabellar wrinkles will be included. All participants will receive the application of a multifilament PDO thread in the glabellar line. In the study group, a 660-nm red LED will be applied punctually around and along the entire length of the wire, which measures 5 cm, totaling 10 application points with a distance of 0.5 cm between them. The LED application will be repeated twice a week, totaling 90 LED applications over 30 days, and the LED sham will be applied to the control group. The primary endpoint of the study will be the assessment of edema, and the secondary endpoints will be the assessment of dermal thickness and thread degradation. The analyses will be performed through observation with linear ultrasound, recording of images lauded by a radiologist and quantified by measures of distance between epidermis and muscle tissue, analysis and identification of the presence of threads. The patient will be monitored for 6 months. Data analysis will follow the principles of intention-to-treat analysis, and statistical analysis will use a general mixed model, with a confidence.

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Temperature analysis during soft tissue incision of different laser wavelengths (445 nm, 1064 nm, "nanoyag", 2940 nm)

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Abstract

Background. In the last years, many innovations have been developed in oral surgery owing to laser use. This technology can find applications in almost all of oral surgery procedures, such as incisional biopsies, excisions of hard and soft tissue lesions, frenulectomies, gingivectomies, photocoagulation of vascular lesions, dental extractions, apicoectomies, implants positioning, sinus lift surgery, and graft harvesting. The preservation of the bone and soft tissues, relatively the thermal rise and the purity of the cut, are the prerequisites for choosing the right instrument.

Objectives. The aim of this comparative study was to analyze in an ex vivo model the thermal elevation induced by different device in soft tissue.

Materials and methods. Comparison of 4 different cutting tools:

1. nanoYAG: 300 micronfiber, 1.2 W, 25 Hz;
2. Nd:YAG : 300 micronfiber, 3.5 W, 70 Hz;
3. PIO-ON450 nm: 450 nm, continuous mode, power 3W;
4. Er:YAG : R02 handpiece, H_2O temperature = 25°C, SSP mode, 230 mJ, 30 Hz, 6.9 W.

The supraphysiological temperature rise during laser irradiation in the oral soft tissues induces the risk of thermal damage to the surrounding periodontal ligament and bone.

Results. Our experience confirms that the laser photobiomodulation is a safe, noninvasive procedure with very low temperature increase (between 2.16°C and 3°C) and without risks of dental, periodontal, soft or hard tissues damages.

Diode and Nd:YAG laser wavelength has high selectivity for hemoglobin and poor water absorption, and it allows to operate rapidly and with good hemostasis; the heat dissipation occurs rapidly and this tool can be used safely, keeping in mind its ability to penetrate into the tissues of up to 7 mm. The temperature increase is not to be ignored when these surgical instruments are used in order to benefit their coagulating potential while respecting tissues around the surgical field. In an ex vivo model we do not have blood circulation and hydration action of saliva: for this reason, the efficiency of cutting and the temperature dissipation is lower than in the in vivo model, above all for this wavelength.

The 1064-nm laser with nanopulses induces less thermal increases than Nd:YAG (1064 nm) or diode (450 nm) lasers. The short pulses permit a cooling of the superficial and deep tissues.

It is possible to utilize the Er:YAG laser without air and water spray to obtain a coagulative effect in vivo through a thermal rise. This phenomenon was evident in our experiment during superficial tissue vaporization with a great increase of temperature (nearly 35°C).

Due to the physical properties of the Er:YAG laser and its surface action, the time required to return to the original temperature was relatively short. In 2 different etching situations, water misting and atomized air or not, the re-equilibration time was approx. 5 min. In the incisional area of Nd:YAG, Nano:YAG and diode, the original temperature was restored in a period of 8–9 min.

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Autofluorescence for intraoperative identification of surgical margins of osteonecrosis of the jaw: A new technique supported by the Er:YAG laser

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Abstract

Background. Precise identification of necrotic bone margins during osteonecrosis removal mainly based on subjective parameters is a major difficulty for surgeons. Ristow suggested that when irradiated with a 400–460 nm wavelength, vital bone could be highlighted on the basis of its strong autofluorescence (AF) whereas necrotic bone lost AF and appeared very dark.

Objectives. To describe a new surgical approach for medication-related osteonecrosis of the jaw (MRONJ) using AF in highlighting surgical margins and Er:YAG laser for bone evaporation.

Materials and methods. Surgical treatment, consisting in resection of necrotic bone, was performed under local anesthesia and without preoperative tetracycline labelling. After bone exposure, VELscope™ system (LED Medical Diagnostics Inc., Barnaby, Canada) was used to induce and visualize bone AF. Necrotic bone showed no or only pale AF. After the removal of necrotic bone block, AF was used to guide marginal osteoplasty. According to the AF image obtained after osteoplasty, the Er:YAG laser (Fidelis Plus®, Fotona-Slovenia) was used for evaporation of necrotic bone. Further samples of hyper-fluorescent bone were taken from adjacent areas.

Conclusions. In all patients, the histopathological analysis revealed necrotic tissue in the hypo-fluorescent bone block removed and normally structured bone tissue in the hyper-fluorescent specimens. The future development of this technique could consist in the objective evaluation, carried out through spectrophotometric analysis, of the fluorescence emitted by the necrotic bone compared to the vital one. This objective analysis will overcome the resective surgical option based only on the sensitivity of the individual operator.

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Cellular response induced by low-level laser treatment on human pulp stem cells

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Abstract

Background. The effects of photobiomodulation (PBM) on mesenchymal stem cells (MSCs) are controversial due to heterogeneity in irradiation parameters. However, positive effects on cell proliferation and differentiation have been demonstrated. The biochemical mechanism involved in this increase is not fully understood; however, reactive oxygen species (ROS) production and changes in mitochondrial membrane potential (ΔΨm) are possible mechanisms related to the effects of PBM.

Objectives. To determine the effect of low-level laser therapy (LLLT) on proliferation, changes in ΔΨm, ROS production, and osteoblastic differentiation of human dental pulp mesenchymal stem cells (hDPSCs) treated with 2 different wavelengths and different exposure times.

Materials and methods. Human dental pulp mesenchymal stem cells were isolated from permanent teeth that were irradiated with 660-nm and 940-nm lasers for 5 s, 50 s and 180 s. Cell proliferation was assessed by resazurin assay, cell differentiation was evaluated with RT-qPCR for the detection of RUNX2 and BMP2, and the presence of calcification nodules was assessed with alizarin red S. The ROS production was determined by dichlorofluorescein-diacetate technique and change in ΔΨm was evaluated using tetramethylrhodamine-ester assay (TMRE). Data were analyzed by Student's t-test for parametric and the Mann–Whitney U test for non-parametric results ($p < 0.05$).

Results. The 940-nm wavelength for 5 and 50 s induced a significant increase in cell proliferation at 4 days post-irradiation. At day 6, the proliferation decreased in cultures treated for 5 s, whereas, in cultures treated for 50 s it was significantly increased. At day 8, a significant decrease in proliferation was found in all groups, regardless of wavelength and exposure time. Calcification nodules were evident in all groups exposed to LLLT, with greater intensity of staining in the culture treated with 940-nm laser for 50 s, an effect that correlated with the overexpression of RUNX2 and BMP2. The ROS production and Δψm increased, regardless of irradiation time. The 940-nm wavelength showed a greater tendency to increase the Δψm.

Conclusions. Photobiomodulation with LLLT induced morphological changes and reduction in cell proliferation rate, associated with increased cell differentiation towards the osteoblastic phenotype; a phenomenon associated with increased ROS and Δψm, regardless of wavelength and time evaluated.

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Absorption spectrum of different wavelengths by oral soft tissues

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Abstract

Background. A practitioner needs to have knowledge about absorption properties of each targeted tissue. Therefore, the coefficient of absorption and thermal relaxation time (TRT) of the used light are essential.

Objectives. The aim of our study is to calculate the percentage of attenuation for each wavelength as a function of tissue thickness as well as the percentage of transmittance of each wavelength as a function of tissue thickness. Additionally, we would like to determine the global absorption coefficient of the oral tissue for the most used wavelengths in dentistry and finally, determine the TRT of the oral tissue for the most used wavelengths in dentistry.

Materials and methods. To investigate this concept, we measured the transmission of red and infrared light through sectioned pork oral soft tissues. Each tissue thickness was placed between 2 windows of glass that barely attenuate the light transmission. The input and output powers were measured after irradiating the tissue at different specific wavelengths: 1341, 1064, 980; 940, 810, 632, 532, 480, and 450 nm and at 2780 nm and 2940 nm. After calculating transmittance values, we were able to draw a transmittance curve for each wavelength. Based on the Beer–Lambert law, we calculated the coefficient of absorption of each wavelength in the oral soft tissues. After obtaining the coefficients of absorption, we were able to calculate the thermal relaxation time.

Results. Among the tested wavelengths, the 810-nm laser was the least absorbed in soft tissues ($\alpha = 9.59$ cm-1). The blue laser of 450 nm had an average absorption coefficient ($\alpha = 26.75$ cm-1), whereas the erbium laser of 2940 nm was the most absorbed by soft tissues ($\alpha = 145.8$ cm-1). The TRT for each wavelength was calculated.

Conclusions. Various laser wavelengths are differently absorbed by soft oral tissues and TRT was also different for each wavelength. This is important for the selection of the optimal wavelength and the best irradiation conditions for each clinical application in dental practice. Dental surgeons should be aware of these differences in their daily practice.

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Photobiomodulation: A cell in an altered state of consciousness. A diary of clinical cases from India

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Abstract

Think of a day without sunlight. We would not be able to survive long without light. Light therapy, also called phototherapy or bright light therapy, is intentional daily exposure to direct sunlight or similar artificial light in order to treat mental and other disorders. Low-level laser therapy, also known as cold laser, uses the principle of Biostimulation. The biostimulatory effects play an important role in accelerating the healing processes and providing analgesia. Laser acts on cellular reduction – oxidative potential, stimulating lymphocytes, activating mast cells and increasing the production of adenosine triphosphate (ATP) in mitochondria acting as anti-inflammatory. Furthermore, it leads to the improved proliferation of epithelial cells, increased blood vessels and increased production of granulation tissue. In today's world, laser therapy is the answer to the quest for a treatment that requires less or no medication.

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How to prepare and manage implant sites with lasers and growth factors?

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Abstract

Year after year, medical laser therapy plays a bigger role in our daily practice. Dental implant surgery results, healing and patient comfort are improved by different wavelengths, used in the same treatment session. Growth factors bring a synergistic effect. The purpose of this lecture is to define a reproducible and simple protocol in several clinical cases.

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Effects of low-level Er:YAG laser irradiation on proliferation and gene expression changes of primary gingival fibroblasts isolated from mouse maxilla

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Abstract

Objectives. The purpose of this study was to reveal effects of low-level Er:YAG laser irradiation without photothermal effect on proliferation and alternations in early gene expression of gingival fibroblasts.

Materials and methods. Gingival fibroblasts were obtained from the gingival tissues of mouse maxilla by enzymatic method. All experiments were performed in passage 4. The cells at the bottom of 35-mm culture dish were irradiated with the Er:YAG laser (energy density: 1.8, 3.9 and 5.8 J/cm^2) positioned at a distance of 25 cm for 30 s. Cell surface temperatures were measured before, during and after laser irradiation by thermography on monolayer of primary gingival fibroblasts at room temperature (25–26°C). Cell counting Kit-8 and lactate dehydrogenase (LDH) assay were performed for cell proliferation and cytotoxicity. Gene expression levels related to fibroblast function and thermal effect were detected through quantitative polymerase chain reaction. Comprehensive gene analysis (RNA-Seq) was performed to cells at 3 h after 3.9 J/cm^2 irradiation.

Results. The Er:YAG laser irradiation at 3.9 J/cm^2 promoted cell proliferation without significant changes in LDH or Hspa1a expression. Three hours after irradiation at 3.9 J/cm^2, the expression level of Fn1 was significantly increased. The RNA-seq identified 15 differentially expressed genes between irradiated and non-irradiated cells, some of which were defined as immediate early genes (IEGs). Kyoto Encyclopedia of Genes and Genomes pathway analysis indicated MAPK pathway enhancement. The increase of Dusp4, Dusp5, Ereg, Nr4a1, and Vegfa expression was confirmed via transcripts per million from RNA-seq. Gene set enrichment analysis and Gene Ontology analysis showed enrichment in TGF-β signaling gene set, and "positive regulation of cell proliferation" and "positive regulation of cell migration", respectively.

Conclusions. The Er:YAG laser irradiation, especially at 3.9 J/cm^2, enhanced proliferation without a significant photothermal effect, possibly via MAPK pathway following IEG expression.

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The effect of systemic versus local transcutaneous laser therapy on tension-type cephalea and orofacial pain in post-COVID-19 patients: A protocol of pragmatic randomized clinical trial

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Abstract

Background. Orofacial pain and tensional cephalea were symptoms commonly reported in coronavirus disease 2019 (COVID-19) patients even after recovery, and were considered chronic pain in these cases.

Objectives. The aim of this research is to evaluate the effect of the application of photobiomodulation with red and infrared lasers applied locally and systemically.

Materials and methods. For this purpose, individuals who have been diagnosed with COVID-19, confirmed by reverse transcription polymerase chain reaction (RT-PCR) for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) already recovered at least 30 days from the infection, and have had a tension headache and/or orofacial pain for more than 3 months will be selected by convenience. This is a pragmatic, randomized, parallel, single-blind clinical trial. The participants will be divided into two different groups: G1photobiomodulation with red and infrared laser with local application on the pain points (808 nm and 660 nm, 100 mW, 6 J per point) and G2-photobiomodulation with red laser with transcutaneous application on the radial artery (660 nm, 100 mW, 30 min). All participants will be treated for a period of 4 weeks, with 8 application sessions. The interventions will be performed by trained professionals. The effects will be measured by means of blood lactate level – the lactate level will be collected once a week, before and after the application of the protocol. The lactate level is related to muscle activity and may help in the understanding of the effect of photobiomodulation in this research; Brief Pain Inventory – is a multidimensional instrument that uses a 0 to 10 scale to grade the pain. Rated by the participant is that experienced at the time of the questionnaire and the most intense, least intense, and average pain of the last 24 h, applied weekly; Visual Analog Scale (VAS) – one-dimensional instrument for pain intensity assessment. It is a line with the ends numbered from 0 to 10. At one end of the line is marked "no pain" and at the other end "worst pain imaginable." The participant is then asked to evaluate and mark on the line the pain present at that moment, will be applied at the beginning and the end of each session; and Cephalea Impact Test – to evaluate the impact of the protocols used in the treatment of headache on the participants' quality of life, applied at the four moments of the participant's evaluation, according to the study protocol. The data will be collected and the following tests will be applied: Analysis of variance (ANOVA), Tukey paired t test, Kruskal–Wallis, or Wilcoxon, according to data distribution. $\alpha = 0.05$ will be considered as the level of statistical significance.

Results. Results will be disseminated through peer-reviewed journals and events for the scientific and clinical communities, and the general public. The study is registered in the ClinicalTrials.gov database with the number NCT05430776.

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Evaluation of the effectiveness of antimicrobial photodynamic therapy and deproteination on permanent teeth with molar incisor hypomineralization (MIH) and the association with the longevity of restorations: Controlled blind clinical trial

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Abstract

Molar incisor hypomineralization (MIH) is a qualitative developmental defect of enamel that occurs in the mineralization phase. The MIH affects one or more permanent molars and occasionally permanent incisors. Patients with this condition have an increased risk of caries, hypersensitivity and restoration failures. The aim of the proposed study is to evaluate the clinical effect of antimicrobial photodynamic therapy (PDT) on permanent teeth with MIH to promote decontamination and perform deproteination. Patients aged 6–12 years with permanent molars will be randomly allocated to 3 groups. The selected teeth must have a carious lesion in the dentin and post-eruptive enamel breakdown on one or more surfaces with an indication for clinical restorative treatment. Selective chemical-mechanical removal of carious tissue will be performed with Papacárie^{TM} (F&A) applied to the carious dentin and adjacent demarcated opacities to achieve deproteination. In Group 1, PDT will be performed with low-level laser and 0.005% methylene blue as the photosensitizer with an irradiation time of 3 min. Group 2 will be submitted to selective removal of the carious tissue, PDT with low level laser and 0.005% methylene blue as the photosensitizer with a pre-irradiation time of 3 min and deproteination with a 5% sodium hypochlorite solution. In Group 3, selective removal of the carious tissue will be performed with a dental curette. The teeth will subsequently be restored using a mixed technique with resin-modified glass ionomer cement and bulk-fill composite resin. All patients will be followed up after 48 h and at 3-month intervals for a period of 12 months. The effects of PDT will be evaluated in terms of decontamination (microbiological analysis) and post-treatment sensitivity (visual analog scale and Schiff Cold Air Sensitivity Scale). The effects of deproteination on the longevity of the restoration will be evaluated using the modified USPHS index. The data will be submitted to descriptive statistical analysis. Associations with age and sex will be tested using either the χ^2 test or Fisher's exact test. Pearson's correlation coefficients will be calculated to determine the strength of correlations between variables. Comparisons of the microbiological results (colony-forming units) will be performed using analysis of variance (ANOVA) and the Kruskal–Wallis test. To assess the performance of the restorations performed, the Kaplan–Meier survival assessment will be made.

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Evaluation of the effects of high-level diode laser and electrocautery in lingual frenectomy surgeries in infants: Protocol for a blinded randomized controlled clinical trial

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Abstract

Background. Ankyloglossia is characterized by an abnormally short, thick or thin lingual frenulum, which can restrict tongue movements and negatively interfere with breastfeeding, reducing the ability of the newborn to latch on, suck and extract adequate breast milk. The conduct of a newborn with a positive test for ankyloglossia should always consider whether or not this condition interferes with breastfeeding and, for this reason, the importance of evaluating breastfeeding as a routine procedure should be taken into account. In case of breastfeeding problems due to ankyloglossia, lingual frenectomy is recommended to release the lingual frenulum and allow the tongue to move.

Objectives. This study evaluated the release of the lingual frenulum, through lingual frenectomy, of newborns aged 0–3 months, who had ankyloglossia with surgical indication, performed by thermal instruments such as electrocautery and high power diode laser.

Materials and methods. The study evaluated 57 participants, randomly divided into 2 groups, 23 in the electrocautery group and 34 in the laser group. The tongue movement condition was diagnosed through clinical evaluation and the Bristol Tongue Assessment Tool (BTAT) protocol, recommended by the Brazilian Ministry of Health, before and 15 days after the surgical procedures, as well as the application of the visual analogue scale (VAS) pain test for the nursing mothers. Through the on-site clinical examination and standardized photographs, it was possible to assess the condition of the tongue and observe the feeding according to the UNICEF indications. For both groups, patient history will be taken, clinical evaluation will be performed and a standardized photograph of the lingual frenulum will be taken before surgery. We will evaluate mother's pain during breastfeeding before, immediately after, and 15 days after surgery.

Discussion. There is still no consensus on the indications or surgical method for repairing ankyloglossia. Both surgical techniques used in this study were safe, effective, caused little bleeding and few postoperative complications. The use of high power diode laser indicated for lingual frenectomy as described in this study did not have the expected result, showing postoperative scarring with a high chance of fibrotic scarring, when compared to the use of electrocautery. The discussion is that with the use of high power laser, it is possible to change the parameters for its use until it meets the needs, and in relation to the use of electrocautery this is not possible. Although the laser in this research presented a higher number of relapses, the use of electrocautery showed a significant number of relapses, not indicating that it is a better instrument in relation to this issue. The other great advantage of using high power laser is that it does not cause any type of local inflammation in the postoperative period, reducing the possibility of the participant to feel pain after surgery or use analgesics.

Conclusions. The authors concluded that more specific studies on this subject are needed, suggesting a change in parameters in the use of high power diode laser, such as the mode of energy delivery and power used for each specific age, in addition to the follow-up carried out by the transdisciplinary team for the rehabilitation of tongue functions and effective breastfeeding.

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Effectiveness of non-ablative treatment for snoring and obstructive sleep apnea with two high-intensity pulsed lasers: A controlled randomized double-blind clinical trial

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Abstract

Primary snoring and obstructive sleep apnea (OSA) represent different severity degrees of the same disorder, which affects one billion people worldwide. Increased cardiovascular risk, emergence of chronic diseases and use of medications result from disease worsening and represent a major challenge for health systems. A palatopharyngeal muscle tone dysregulation plays a significant role in this disorder. All therapeutic approaches have limitations. Speech therapy exercises show improvement in muscle tone, reducing snoring and OSA, positively signaling laser treatment, which can contribute to improvement of sleep breathing disorder (SBD). This study aims to evaluate the treatment of SDB with high-intensity non-ablative irradiation with 2 pulsed lasers: Nd:YAG laser (1064 nm) and Er:YAG laser (2940 nm), comparing results before and after the intervention. After obtaining the approval of research ethics committee, 30 volunteers from primary snoring to moderate OSA were treated in 3 sessions of laser irradiation, 14 days apart. Upper airway lumen was analyzed, according to modified Mallampati index by 3 independent, blinded and calibrated evaluators. Oxyhemoglobin desaturation index (ODI), severity of snoring and sleep quality were also evaluated. The observation of variability for each outcome allowed for the analysis of difference between the experimental periods in relation to baseline for each variable and the behavior of laser group in relation to control. Then, classification "Reduced" or "Didn't Reduce" was assigned to the variation above, making it possible to apply the χ^2 test corrected by Fisher, with a significance level of $\alpha = 5\%$. The main clinical result obtained is the expansion of upper airways lumen (control and laser group variation: (0.0 ±0.0); (–25.0 ±50.0) with $p = 0.00060$). Therefore, the improvement of ODI (19.6 ±67.6); (–18.1 ±88.2) with $p = 0.018$; snoring time (64.8 ±179.1); (–1.5 ±85.0) with $p = 0.034$; snoring peak amplitude (–8.3 ±12.3); (–12.4 ±15.8) with $p = 0.029$ were observed. Non-ablative laser treatment is effective in rehabilitation of patients with SBD. In the protocol used in this work, the procedure is performed without need of medication or anesthesia. The expansion of upper airways lumen by decreasing tissue compliance leads to improved sleep quality, snoring severity and daytime sleepiness ($p = 0.00026$, $p = 0.02171$ and $p = 0.027$, respectively), contributing to the improvement of observed health parameters.

Key words: primary snoring, obstructive sleep apnea, high-intensity pulsed lasers

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Violet LED associated to bleaching agents and the effect over dental enamel

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Abstract

The susceptibility of multispecies cariogenic biofilm (*S. mutans*, *S. sobrinus* and *A. naeslundi*) to antimicrobial photodynamic therapy (aPDT) using ETNBS and BPD (PSs) at 5, 10, 20, 40 and 80 μM irradiated by a red laser at 635 and 690 nm under 10, 30 and 60 J/cm^2 and 5 min of pre-irradiation time was evaluated. The mechanisms of aPDT were also assessed. Biofilms were cultured in BHI+1% sucrose (*S. mutans* and *S. sobrinus*) and Actinomyces (*A. naeslundi*) broth for 3 days in a 96 well-plate. Serial dilutions were seeded onto BHI and Actinomyces agar to determine viability by CFU counting. The metabolism of the biofilm by XTT and confocal laser scanning microscopy (CLSM) was performed using BacLight® LIVE/DEAD and Dextran Alexa Fluor TM 647. Different groups were evaluated: L-D (negative control), L-D+ (drug), L+D- (light), L+D+ (PDI) and chlorhexidine at 0.12% (positive control). Two-way analysis of variance (ANOVA) and Tukey's test ($p < 0.05$) were performed. Qualitative analyses were obtained as to the distribution of non-viable/viable cells after treatments. Statistically significant difference was observed for aPDT and chlorhexidine groups compared to negative and light controls ($p < 0.05$). Antimicrobial photodynamic therapy using ETNBS and BPD can be an adjunct and effective method to control cariogenic biofilm.

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Laser-assisted endodontic treatment with an erbium:YAG on SWEEPS mode in molars with complex internal anatomy: A case series

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Abstract

Background. The root canal anatomy is complex, especially in molars, and includes extra canals, isthmuses and accessory canals. Different irrigant agitation techniques have been used in endodontic treatment.

Objectives. The aim of this study is to present 7 clinical cases of laser-assisted endodontic treatment and retreatment with an Erbium:YAG (SkyPulse Endo – Fotona) in molars with SWEEPS mode.

Materials and methods. Clinical examination and periapical X-ray and cone beam computed tomography (CBCT) were performed in 6 lower molars and 1 upper molar with internal complex anatomy from 7 patients. After the differential diagnosis, the endodontic treatment plan that consists in laser use in endodontic treatment with an Erbium:YAG (SWEEPS) was made. The erbium laser energy at low settings of 50–75 mJ in water and NaOCl causes vaporization and formation of large elliptical bubbles. The bubble's collapse forms shock waves that can be remarkably effective in removing the contamination of the cavity surfaces.

Results. In all clinical cases, the SWEEPS mode promoted a permeabilization of the apical third and the isthmuses and allowed bio-ceramic sealer extrusion into the apical foramen, increasing the success rate of this endodontic retreatment.

Conclusions. The erbium Laser on the SWEEPS mode, with sharp protocol, can easily allow the irrigants to access the ramifications of the canal, which might have an added value in the cleaning of canals of various shapes and improve the root canal obturation.

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Laser management of HPV-related oral infections

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Abstract

Background. Human papilloma viruses (HPVs) are a large group of small DNA viruses without pericapsid, which show a peculiar tropism for squamous epithelial tissue. To date, more than 250 different types of HPVs have been identified and classified into 5 different genera. Oral HPV is often associated with benign lesions such as papillomas and condylomas. Some HPV subtypes (16 and 18) are associated to potentially malignant and malignant lesions. Surgical excision is the more effective treatment, and it consists in the complete removal of oral lesions. The main disadvantages of traditional surgery are the need for anesthesia, frequent bleeding, difficulty of radical removal of widespread lesions, formation of scars, and a higher recurrence rate. In fact, the treatment of oral papillomas and condylomas with traditional surgery can sometimes be complex since HPV tend to spread and disseminate, causing multifocal lesions in the oral cavity. Furthermore, HPV-related lesions tend to recur if incompletely removed.

Objectives. The aim of this work was to show how laser surgery can overcome the disadvantages of traditional surgery in the management of HPV-related oral lesions.

Materials and methods. Our experience at the Unit of Oral Surgery and Medicine of the University of Parma is based on the removal of the 300 HPV-associated benign lesions between 2004 and 2022. In all cases, after locoregional anesthesia, complete removal was performed through several instruments, including cold blade, quantum molecular resonance (QMR) scalpel, Nd:YAG laser (1064 nm, 3.5 W, 70 Hz) and diode laser (445 nm, 3.5 W-continuous wave, PD: 3750 W/cm^2, fluence: 62,5 J/cm^2). Histopathological analysis was performed in each case, confirming the diagnostic of HPV-related lesions.

Results. Comparing different surgical techniques, the approach based on the use of laser is more effective and advantageous. Laser removal is associated with a decrease of bleeding, a faster healing time, possibility to obtain a second intention wound process, less post-surgical pain and less recurrence rate. Most probably, cell disruption on the margins of lesion avoids viral spread and further infections.

Conclusions. Laser surgery obtains better results in terms of more radical excision. As recently demonstrated, laser surgical excision with more than 3 mm of free margins seems to be the best therapeutic approach for the treatment of oral HPV lesions.

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Endodontic surgery with Er:YAG laser: A stereomicroscopic evaluation on ex-vivo models

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Abstract

Background. Endodontic surgery is a treatment aimed at periapical healing, generally after the failure of orthograde therapy. Apex resection is traditionally performed with diamond burs and ultrasounds with 45 degrees of angle of cut then the major axis of the root. Since 1990, laser technology has also been used for root resection.

Objectives. Our first objective was to review the relevant literature specifically evaluating the advantages of Erbium:YAG (Er:YAG) laser compared to classic methods in the clinical practice of endodontic surgery. The second aim of the present study is to perform an ex-vivo, qualitative analysis on the cut surface.

Materials and methods. Based on the Medline search, 27 papers on the use of Er:YAG laser in endodontic surgery were selected. Thirty extracted single-rooted teeth (upper and lower incisors, upper and lower canines and lower premolars) were collected to evaluate the efficiency of erbium laser cut. After sectioning their crowns, they were treated endodontically (step-back shaping technique and vertical condensation and carrier-based obturation). The samples were divided into 3 groups according to the cutting methods: 1. With a diamond bur (016, standard granulometry, Komet®); 2. Er:YAG laser with QSP mode (Quantum Square Pulse, energy: 600 mJ, frequency: 10 Hz, power: 6 W, with a rate of water/air of 4:6); and 3. Er:YAG laser with SSP mode (Super Short Pulse, energy: 300 mJ, frequency: 30 Hz, power: 9 W, with a rate of water/air of 4:6). After a 45-degree resection at 3 mm of the apex, the roots were analyzed under the stereomicroscope (SMZ25; NIKON, Tokyo, Japan) with a ×40 magnification. Microscope pictures of the various cuts were taken and for each root, the presence on the surface of debris, homogeneity and time of cutting were calculated. Also, cutting time was compared among the 3 groups.

Results. In literature there is no absolute agreement on the advantages brought by the use of laser for apicoectomy. However, out of 27 papers, 1 have demonstrated a better hemostasis, 3 – the absence of smear-layer, 1 – a smooth surface, 7 – less discomfort for the patient and 8 – a better apical seal. With regard to ex-vivo experimentation, we did not observe a statistically significant difference among the samples with regards to the cutting homogeneity and roughness surface. It was observed that erbium leads to a more homogeneous (70%) and linear surface than the bur (50%). Finally, cutting time with SSP and diamond bur were comparable, while with the QSP mode, the cutting time was longer.

Conclusions. Due to its cut quality, the Er:YAG laser is an excellent resource in endodontic surgery.

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Photobiomodulation efficacy of major salivary glands in children with caries activity: Study protocol for randomized, double-blind, placebo-controlled, parallel-group clinical trial

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Abstract

Dental caries is a non-communicable, dental biofilm-mediated, diet-modulated disease that results in net loss of minerals from dental hard tissues. Currently, dental caries is one of the most prevalent diseases among children worldwide. Saliva is essential for maintaining oral health and plays a leading role in the demineralization-remineralization process of the dental surface, as well as in preserving the integrity of oral tissues. Patient salivary characteristics, such as flow rate, pH and buffering capacity, provide relevant information about patient's risk for developing carious lesions. In the last few decades, photobiomodulation (PBM) has shown promising results improving salivary flow rate as well as buffer capacity in adult population. To date, most of the published studies have evaluated the effect of PBM on salivary glands with parafunction due to hyposalivation, xerostomia, Sjogren's syndrome, or after radiotherapy. Very little is known about the effect of PBM on the salivary glands and its relationship with dental caries. To the best of our knowledge, no studies evaluating the effect of PBM on the major salivary glands associated with dental caries in children have been published. The purpose of this trial is to evaluate the efficacy of PBM of the major salivary glands on salivary parameters in children with caries activity in Montevideo, Uruguay. The protocol of the study details a randomized, placebo-controlled, double-blind clinical design, consisting of an intervention phase for the application of extra – and intraoral PBM for 3 consecutive weeks, once a week, in 50 children aged 6–12 years. Ethics approval (Catholic University of Uruguay, approval No. 220803) and parents' consents have been obtained. The trial has been registered in clinicaltrials.gov under the ID No. NCT05546528. Participants will be randomly divided into 2 groups: 1) PBM experimental group (G1) (n = 25), 2) PBM placebo group (G2) (n = 25). Infrared light will be applied in 16 intra- and extraoral points and the placebo, respectively. Non-stimulated salivary sample will be collected and analyzed before and immediately after the intervention once a week, for 3 consecutive weeks. Photobiomodulation of the salivary glands will be performed in 16 extra- and intraoral sites, once a week, for 3 consecutive weekly sessions, of an average duration of 26 min per session. One week after the last session, a new evaluation of salivary parameters will be performed. This session will only include salivary collection. Salivary samples will be analyzed for flow rate, pH and buffering capacity. The primary outcomes are differences in salivary flow rates between the G1 and the G2 at baseline-final intervention. The secondary outcomes are differences in salivary pH and buffering capacity between the G1 and the G2 groups at baseline-final intervention. The protocol for the study was written in accordance with Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) (https://www.spirit-statement.org) to improve the quality of reporting. The results of this clinical trial will offer evidence for the efficacy of PBM regarding salivary parameters and to support decision-making regarding non-invasive treatments to control dental caries.

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Transmucosal radiation of blood or B complex used to treat COVID-19-related long-term taste impairment

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Abstract

Objectives. To evaluate the effectiveness of transmucosal radiation of blood or B complex used to treat patients expressing coronavirus 2019 (COVID-19)-related long-term taste impairment.

Materials and methods. Participants (n = 14) with the expression of COVID-19-related long-term taste impairment (CRLTTI), minimum 2 months after severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, with laboratorial comprobation tests were included in the study. Participants were blindfolded and evaluated for their perception of hyperconcentrated substances, before and after the experimental protocol. Salt (0–10), sweet (0–10), acid (0–10), and bitter (0–10) were evaluated and their sum was considered for statistical analysis (0–40). Self-reported Olfact was also assessed (0–10), with 10 indicating the perfect perception as perceived before COVID-19 contagion. Delta of initial and final results was considered for statistical analysis. Furthermore, participants were randomized into 2 groups: G1 – 660 nm, 100 mW, 0.0984 cm^2, 9 J per point, 9 points in ventral surface of tongue (transmucosal irradiation of blood); G2 – B complex (5,000 I.U.) – 8/8 h during 30 days. The laser group had a total of 8 sessions, held twice a week, with a minimum of 48-h space between sessions.

Results. The summary values of all hyperconcentrated tests (0–40) demonstrated higher results in G1 = +10.7 (standard deviation (SD) ±10), when compared to G2 = +3.57 (SD ±7.28) ($p > 0.05$). The same tendency was observed in Olfact (0–10), with an average increase in G1 of 2.14 (SD ±2.12) and in G2 of 1 (SD ±1.15) ($p > 0.05$). Salt substance appears to be not as affected by CRLTI as sweet, acid and sour. Average time of CRLTTI expression in this population was 13.1 months (SD ±8.68), with women representing 64.3% of the sample and with an average age of 38.5 years (SD ±8).

Conclusions. Transmucosal laser irradiation of blood and B complex can reduce the expression of the symptoms related to CRLTTI in patients. Transmucosal irradiation of blood demonstrated better results when compared to B complex supplement to treat CRLTTI.

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KTP LASER – a superlative tool in dental esthetics: From the treatment of dental stains to angiomas

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Abstract

Objectives. The purpose of this work is to describe and present the efficient and versatile KTP laser technology in the outpatient dental clinic. This device, indeed, with the right learning curve, can become a very useful machine in all fields of dentistry from oral surgery to oral pathology, periodontology and implantology, with a particularly elective use in dental esthetics for whitening, and treatment of angiomatous lesions.

Materials and methods. For the treatment of all illustrated clinical cases, we used a KTP laser system (acronym for potassium titanyl phosphate). It emits the 532-nm wavelength of the electromagnetic spectrum, mainly absorbed by hemoglobin but also melanin, for which reason this machine (SMARTLITE COMBO DEKA) has a dual use, oral and dermatological. The average power used in dentistry is 3 W, while in dermatology it is 5 W. This laser is superlative in dental esthetics in the processing of the complex whitening of intrinsic stains due to tetracycline or fluorosis and in the removal of angiomas. Equipped with a green ray, combined with a whitening gel filled with red chromophore, it increases the production of specific ions which break the long molecules of the intrinsic pigments in dentin and enamel. That way the molecules no longer absorb the incident light in the visible part and teeth get a lighter and brighter color. On the other hand, for the treatment of angiomas, the laser is able to easily and promptly detect the localized collection of blood. It works without needing contact and damaging the surface epithelium, which ensures a comfortable and rapid healing of the unsightly lesion.

Results. We presented various clinical cases of patients affected by intrinsic dyschromia from drugs and fluorine, with relative therapeutic protocol, and other cases of patients burdened by the presence of angiomatous lesions, from small angiomas to more imposing hemangiomas and related treatment protocols.

Conclusions. The KTP laser has proved to be an effective and versatile means in the treatment of clinical cases where the patient asked for a specific esthetic result (the esthetic request has been particularly desired by the patient). Concerning the treatment of angiomas, the KTP laser has a particularly gentle, fast and clean action and ensures maximum respect for the eutrophy of the treated tissues. The removal of these angiomas was gentle and, thanks to the induced homeostasis, enabled decontamination, a bloodless surgical field, with a consequent reduction of the duration of the session. Moreover, a bio-stimulation of the treated tissue is also induced with a consequent better healing. All these positive factors make the treatment session and post-treatment very comfortable for patients. This treatment usually does not require a suture, nor a post-operative big pharmacology therapy, and the use of anesthesia is minimized. Thanks to the action of its green light, the KTP laser is, therefore, ideal and elective for teeth whitening on intrinsic stains, otherwise difficult to be treated with classic whitening procedures.

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Accelerated orthodontic tooth movement by low-level laser photobiomodulation: Problems and perspectives

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Abstract

Some recent reviews and the Editorial by Marques reported the low quality of evidence on the effectiveness of photobiomodulation (PBM) in orthodontics. In addition, exaggerated claims have been reported in systematic reviews (SR) related to accelerated orthodontic tooth movement (OTM), with a remarkable prevalence (13.6%) of SR concerning PBM therapy. It is known that the main reasons for the lack or low quality of evidence on PBM effectiveness are: a) wide heterogeneity of both laser and treatment parameters, b) different irradiation protocols (from a single application to repeated applications), c) lack of specific parameters in orthodontic practice, d) limited evidence about the adverse effects of PBM therapy, in addition to non-transparent reviewing process.

Our aim is to discuss some other weaknesses of the research regarding: a) the orthodontist's dilemma around the question: What is the upper acceleration limit of the OTM?; b) measuring the accuracy of OTM; c) photoabsorption and photoreceptor activation, involved at 1064 nm by Nd-Yag laser, during the "orthodontic cell concert"; d) informed consent for orthodontic treatment; e) ergonomics in the orthodontic office; f) exaggerated claims on the social media platform (7–9). Because of the complex molecular mechanisms during OTM, more studies on animal models, using multiplex imaging technology, gene expression microarray analysis on tissues and salivomics are required. Researchers are needed to solve the main reasons and the weakness of these topics as well as to obtain firm evidence and reproducible studies, and therefore clearer clinical indications for orthodontists.

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Analysis of acid resistance of enamel treated with Nd:YAG laser and fluoride in different pHs

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Abstract

Background. High power lasers can be used in caries prevention to increase resistance of tooth structure to demineralization through changes in microstructure.

Objectives. This study was designed to evaluate the preventive effect of treatment with the Nd:YAG laser and fluoride on dental caries by analyzing the acid resistance of treated enamel subjected to different pH conditions.

Materials and methods. A total of 180 samples of human dental enamel were prepared, homogenized with surface microhardness and randomized into 12 groups (n = 15): negative control, positive control (fluoride only), Nd:YAG irradiation, and Nd:YAG + fluoride. Each treatment included 3 different groups for pH cycling, at pH = 5, pH = 4.5 and pH = 4. In the proposed treatment, topical application of acidulated phosphate fluoride (1.23%) was used followed by laser irradiation (Nd:YAG, l = 1,064 nm, energy density per pulse = 84 J/cm^2, repetition rate = 10 Hz, pulse width = 300 ms). Samples were analyzed using optical coherence tomography (OCT) and Fourier transform infrared spectroscopy (FTIR) in the attenuated total reflection (ATR) mode. The OCT is a non-contact imaging technique which generates cross-sectional images of tissue with high resolution, providing a profile of backscattered light intensity over tissue depth that can indicate the demineralization level. Intensities of infrared bands (ATR/FTIR) are proportional to the amount of components in the tissue, allowing to determine variations which occurred due to a specific treatment.

Results. In FTIR, the areas under the collagen, phosphate, carbonate, amide I, and amide II bands were analyzed using the locally developed software – IR Hard Tissue®. There was an increase in the phosphate values in the Nd:YAG + fluoride group, with a statistical difference regarding pH = 4.5 (multiple comparison analysis of variance (ANOVA) + Dunnett, $p > 0.05$). There was a positive decrease in collagen in the Nd:YAG + fluoride groups, with a significant difference for the other groups at pH 4.5, and a significant difference for the other groups at pH 4, except for the isolated Nd:YAG group. There was no statistical difference for carbonate values. In the OCT analysis, a decrease in the attenuation coefficient was noticeable, indicating less demineralization. At pH = 5, there was a significant difference in the Nd:YAG + fluoride group for all treatments, except for the isolated Nd:YAG group. At pH = 4.5 and pH = 4, the only group with statistical difference from the others was the Nd:YAG + fluoride group (multiple comparison ANOVA + Dunnett, $p > 0.05$).

Conclusions. The treatment with the Nd:YAG laser and fluoride is effective in increasing enamel acid resistance, being more beneficial than the use of fluoride alone, even in critical pH conditions for fluoride-treated enamel (pH = 4.5).

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Minimal intervention treatment with LED in pediatric patients diagnosed with bruxism and Down syndrome

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Abstract

Background. Muscular hypotonia in Down syndrome (DS), particularly of the masticatory and oropharyngeal muscles, is one of the main characteristics of individuals with DS, resulting in impairment of speech, swallowing and mastication in these individuals. In addition, total or partial obstruction of the airways during sleep may occur due to hypotonia of the tongue, leading to snoring and sleep disorders such as obstructive sleep apnea and bruxism.

Objectives. To evaluate the efficacy and safety of intervention with LED device for the treatment of spasticity of the masticatory muscles in individuals with DS.

Materials and methods. After obtaining the approval of the ethics committee, individuals aged between 4 and 17 years with a diagnosis of DS and bruxism will be screened at UNINOVE's integrated health outpatient clinic. The selected participants will be evaluated, and the NOT-S questionnaire will be applied to assess orofacial dysfunction. The participants will be submitted to an electromyography exam of the masticatory muscles. After the evaluations, we will start the application of the LED in masticatory muscles and we will perform a new electromyographic collection after the application. Each LED device contains 6 LEDs with a wavelength of 660 nm. The treatment will be carried out 1 times per week for 3 sessions. Data will be tabulated and processed using GraphPad PRISM software version 7.0. The values will be tested for normality using the Kolmogorov–Smirnov test, and will be expressed as mean and standard deviation if the Gauss curve is assumed. For comparison between groups, a t-test will be performed, considering a significance level of 0.5% ($p < 0.05$).

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Effect of transcutaneous photobiomodulation (ILIB) on the control of childhood anxiety in dental care: Double-blind randomized clinical trial

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Abstract

Background. Generalized anxiety disorder (GAD) is a chronic psychiatric condition characterized by a widespread and disproportionate concern for adverse life circumstances and the anticipated occurrence of catastrophic and dramatic events. Often, the challenges of everyday life, whether potential or real, are feared, as they are expected to increase and lead to irreparable consequences. Currently, photobiomodulation is a practice successfully implemented in many areas of health. In the area of anxiety disorders, photobiomodulation has shown very promising results, improving patient's behavior. Photobiomodulation is a non-invasive therapy, and with enough evidence of its safety, it can complement traditional behavioral management techniques.

Objectives. The objective of this study is to investigate whether photobiomodulation (ILIB) helps in the management of the child's anxiety in the dental office.

Objectives. The general objective is to assess the control of childhood anxiety, in children aged 6–12 years, in dental care using transcutaneous photobiomodulation as a method to reduce it. Specific objectives are: to compare children aged 6-12 years, based on the visual image scale (FIS), the Venham scale, anxiety, as well as blood pressure, pulse and oximetry after the application of ILIB.

Materials and methods. The sample will be selected from the assistance centers that have an agreement with UCU University Health Clinic. Participants will be randomly distributed into 2 groups: experimental group (G1) and control group or placebo (G2), where ILIB and placebo will be applied, respectively. The level of anxiety will be evaluated by facial image scale (FIS) and the Venham Imaging Test (VPT) in the conditioned room prior to dental care. Physiological parameters will also be measured: blood pressure, oximetry, heart rate, pulse, weight, height. The ILIB applications will be carried out in 2 clinical sessions with an interval between them of at least 48 h.
After the data have been collected, the corresponding descriptive analysis will be carried out. The conclusions obtained in this study will provide evidence for the future treatment of patients with anxiety disorders in front of the dental office.

Intervention protocol. Prior to the indicated dental treatment, in the second encounter with the child, the ILIB will be applied. The equipment to be used is Therapy EC (DMC, San Carlos, Brazil).
The red light laser therapy will be applied with the aim of reducing the anxiety of children during the dental consultation. It will be continuously and directly implemented with 60 J of energy, wavelength of 660 nm and 100 mW/cm^2 of power. The therapy will be applied in the unilateral radial artery for 10 min. The laser will be transmitted through an appropriate bracelet where the laser tip fits perfectly. It is a painless, non-invasive method that does not cause any discomfort during application.

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Analysis of facial muscle activity in children with a diagnosis of Down syndrome pre and post led application

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Background. Individuals diagnosed with Down syndrome have muscular hypotonia, mainly of the facial and oropharyngeal muscles that are involved in the masticatory cycles, which compromises swallowing, speech and mastication.

Objectives. To evaluate the facial muscle activity through electromyographic analysis of the main facial muscles involved in the masticatory cycle (masseter and temporal) of individuals diagnosed with Down syndrome and bruxism, pre and post application of LED. This study will be a clinical trial. After obtaining the approval of the ethics committee, screening of individuals aged 4–17 years who have a diagnosis of Down syndrome and bruxism will be carried out at UNINOVE's integrated health outpatient clinic. The selected participants will be evaluated and submitted for electromyography examination of the masticatory muscles (right and left masseter and right and left temporal) pre and post application of LED boards. Each LED device contains 6 light sources with a wavelength of 660 nm. The treatment will be carried out in one session only, and muscle activity will be evaluated pre and post application of LED. Data will be tabulated and processed using GraphPad PRISM software version 7.0. The values will be tested for normality using the Kolmogorov–Smirnov test, and will be expressed as mean and standard deviation if they assume the Gauss curve. The t-test will be performed for the comparison between groups, considering a significance level of 0.5% ($p < 0.05$).

Key words: Down syndrome, LED, electromyography, child

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Effects of photobiomodulation in the postoperative fractures of the proximal humerus

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Abstract

Among the various complications of postoperative evolution of fractures of the proximal humerus are pain and joint stiffness, generating significant functional limitation in the affected limb. Conventional physiotherapy is the current standard of care for both surgical and non-surgical cases. Studies have shown positive effects of photobiomodulation (PBM) on repair and regeneration of fractures, as well as on analgesia and improvement of physical function. However, they suggest standardization and additional evidence. This randomized controlled double-blind clinical study aims to evaluate the effects of PBM on the postoperative evolution of participants with fractures of the proximal humerus surgically treated with special locking plates. The 40 participants will be randomized and equally divided into 2 groups according to the type of therapy they will receive postoperatively. The control group (conventional physiotherapy associated with simulated PBM) and the PBM group (conventional physiotherapy associated with active PBM). Photobiomodulation will be performed using a device containing 140 LEDs (70 LEDs of 635 nm and 70 LEDs of 850 nm) using 10 J/cm^2 per LED. Sessions will be held 7 times a week for 3 weeks. Patients will be evaluated 24 h after the surgical procedure and after 7, 14, 21, 60, and 90 days, except for the radiographic evaluation which will be performed every 4 weeks. The main outcome will be the recovery of shoulder function using the Quick-DASH functional outcome scale (Disabilities of the Arm, Shoulder and Hand). Secondary outcomes will be shoulder range of motion (ROM), muscle strength, pain spontaneity during function, and healing of fractures.

Key words: photobiomodulation, humerus, bone fracture, surgery

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Photobiomodulation in the process of skin elevation: Tissue regeneration

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Abstract

Skin flap is a surgical practice commonly used for tissue repair. The loss of skin flaps (SF) due to tissue necrosis is a serious complication that is observed in 2–20% of procedures performed and may occur with mortality. The main cause is tissue hypoperfusion combined with ischemia-reperfusion injury. There is currently no adjuvant treatment that improves the survival of skin flaps without side effects or significant risks. The effect of photobiomodulation stimulation on endothelial progenitor cells responsible for neovascularization and maintenance of vascular endothelial function in the cutaneous flap may be an outcome to improve the healing process favoring tissue reconstruction. This aim of the study was to evaluate the effect of low-intensity laser on skin flaps in mouse. Forty-eight adult male mouse (Balb/C, 20–25 g) were divided into 2 groups: control (n = 24) and experiment (n = 24). We increased the skin flaps on the back of the animals of both groups and submitted to irradiation, with low-intensity laser in the experiment group. In the control group, there was only the simulation of the application. Photobiomodulation in the flap pedicle had a wavelength of 660 nm, radiant exposure of 2 J/cm^2 for a total time of 20 s in scan, in the internal vascular pedicle of the flap. After treatment, the animals were separated into 3 subgroups (according to the day of euthanasia) containing 8 animals each, within the respective control and experiment groups. The animals were euthanized on the 4th, 7th and 10th postoperative day. The treatment with photobiomodulation caused a decrease in necrosis at all postoperative evaluation times with increased interleukin-6 (IL-6) in mice that were not submitted to photobiomodulation therapy and a reduction in tumor necrosis factor-α (TNF-α) and interleukin-10 (IL-10). There was a significant reduction in inflammatory cells in the groups that received photobiomodulation treatment, corroborating the thesis of the protective effect of low-intensity laser in the healing process of the flap.

Key words: photobiomodulation, low intensity laser, surgical flaps, necrosis

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Full face approach in dentistry

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Abstract

Background. Laser therapy is a therapeutic treatment involving the incidence of an electromagnetic beam of laser light with a specific wavelength. Orofacial harmonization is a new specialty of dentistry responsible for the esthetic and functional balance of the face, through different techniques and materials.

Objectives. The main objective of the lecture will be to show how laser therapy can help in the prognosis of orofacial harmonization procedures through its local and systemic action.

Materials and methods. The concepts of laser therapy will be shown through the presentation of clinical cases in order to illustrate the applicability of the modified protocol of systemic laser; laser and LED biophotonics combined with the action of dermocosmetics for skin treatment; and antimicrobial photodynamic therapy for the treatment of complications that may occur in orofacial harmonization treatment modalities.

Conclusions. The search for esthetic perfection requires technological innovation, materials and new techniques in pre- and postoperative treatments in orofacial harmonization. In this context, the beneficial effects provided by low-intensity laser therapy on biological tissues are excellently allied with the clinical practice of the specialty.

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Laser-assisted tooth replantation: A case report

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Abstract

Objectives. Intentional replantation (IR) is an alternative to tooth extraction for managing apical periodontitis where other surgical or non-surgical treatments are not feasible. The potential of adjunctive laser phototherapy and photobiomodulation (PBM) for IR is largely unexplored.

Case description. This case report describes the novel management of an upper left lateral incisor with a large periapical lesion (diameter >10 mm) using IR and adjunctive high – and selective – intensity laser phototherapy and PBM.

A 68-year-old diabetic male presented with a previously root-treated and heavily-restored painful and infected maxillary left lateral incisor which was diagnosed with secondary acute chronic persistent apical periodontitis. The management included pre-operative PBM, conservative extraction, apical root surgery, photodynamic therapy (PDT) of the root surface, Er:YAG root and socket debridement, replantation and post-operative PBM. Two dentists and a laser safety officer with laser safety training delivered the laser-assisted IR, phototherapy and PBM at clinically relevant parameters. The total extra-oral IR time was under 15 min. The tooth was clinically functional at 6-, 12-, 18- and 24-month follow-up with resolution of the periapical radiolucency revealed by radiographic imaging.

Discussion. This case report demonstrated that an adjunctive laser-assisted replantation protocol may be effective in the treatment of periapical lesions in a hopeless tooth, forming the basis of further study.

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The synergistic remineralizing effects of combined use of a 445-nm blue laser and silver diamine fluoride on enamel

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Abstract

Objectives. To investigate whether the combined use of a 445-nm blue laser and silver diamine fluoride has synergistic remineralizing effects on enamel.

Materials and methods. Twenty-three enamel slices were sectioned into 4 blocks for 4 groups. The blocks from each group were treated with laser followed by silver diamine fluoride (LF), silver diamine fluoride (F), laser (L), and water (W, control). Ten blocks from each group were used to evaluate demineralization. Surface morphology was studied using scanning electron microscope (SEM) and their nanohardness was assessed. The remaining 13 blocks per group were used for antibacterial activity assessment, and they were incubated with *Streptococcus mutans* for 24 h. The biofilm morphology and kinetics were assessed by SEM and colony-forming units (CFUs), respectively.

Results. The SEM images of LF-treated enamel showed an intact surface compared with other groups after pH cycling. Besides, the SEM images of LF-treated enamel showed the fewest intact bacteria on their surfaces after 24-h *S. mutans* incubation. Two-way analysis of variance (ANOVA) revealed an interaction effect on nanohardness and Log CFUs between the laser irradiation and SDF treatment ($p < 0.001$).

Conclusions. This study showed a synergistic remineralizing effect of the combined use of 445-nm diode laser and SDF on enamel and the inhibition of cariogenic bacteria. It provides preliminary evidence of treatment combining 445-nm diode laser and SDF on caries prevention.

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Efficacy and durability of oral mucosa keratosis photodynamic treatment versus individual patient characteristics

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Abstract

Background. Keratosis accompanies many diseases of the mucous membrane of complex etiology and various degrees of dysplasia, therefore, treatment and prediction of the effectiveness and durability of treatment should take into account the specificity of the lesions and the individual characteristics of patients. The described cases of photodynamic therapy (PDT) of oral keratosis differ in the method of application of the photosensitizer as well as in the mode and intensity of sensitization. They also differ in the effectiveness and durability of treatment (20–90%). Such large discrepancies may result from the limited effectiveness of photosensitizer application to the tissue with thick keratosis, discrepancies in the mode and intensity of photosensitization, and the diversity of disease cases. The final effect of the treatment is therefore the result of many factors that should be taken into account when choosing the protocol of photodynamic treatment.

Objectives. The aim of the study was to find the statistically dominant factors favoring the development of oral keratosis and the most important features and parameters limiting the effectiveness and durability of their photodynamic treatment.

Materials and methods. Historical data on photodynamic treatment of 57 keratotic lesions of the oral cavity in 24 patients (17 women and 7 men, 25–80 years old, average age approx. 55 years) were used in the analysis. All lesions were treated by the photodynamic method with a 10% solution of porphyrin in glycerin. The treatment of thick keratoses was preceded by multi-point laser deepening (MLD). The analysis took into account, among others patients' age, smoking status, thickness, van Waals keratosis parameters and selected diseases and medications. The principal component analysis (PCA) was used for data processing.

Results. Statistical analysis showed that the percentage of elderly patients, smokers, diabetics, treated with statins, taking hormonal drugs and patients after radio- and chemotherapy was significantly higher than the percentage of a statistical inhabitant of Poland. The principal component analysis allowed to define the most important factors limiting the effectiveness of treatment. These were age, keratosis thickness and all van der Waals criteria. The effectiveness of treatment of thin and thick keratoses of the oral cavity was about 80% (100% for thin keratoses and 61% for thick keratoses). The ineffectiveness of the treatment was correlated with the occurrence of features favoring the formation of keratoses (age, smoking, diabetes, statins, hormonal drugs). In such a case, the treatment was permanent.

Conclusions. The photodynamic method (in the case of thick keratoses preceded by MLD) can be a very effective tool to eliminate extensive keratoses of the oral cavity. The effectiveness and durability of therapy may be limited by the persistence of factors that contributed to the formation of keratosis.

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Photodynamic treatment of thick and extensive oral keratosis: A case study

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Abstract

Background. Keratosis accompanies many mucosal diseases of complex etiology and varying degrees of dysplasia. Typical clinical symptoms of keratosis are white or white-yellow lesions of varying thickness, texture and irregular shape. Keratosis does not cause pain. Pharmacological methods, classical and laser surgery and cryotherapy are used for its treatment. Pharmacological treatment is characterized by low effectiveness and other methods cause tissue loss and scarring. The disadvantage of all these methods of treatment is the high rate of recurrence (approx. 62%). An alternative method of treating diseases of the oral mucosa, including keratosis, is photodynamic therapy. Cases of treating keratosis with the photodynamic therapy (PDT) method described in the scientific literature differ in the method of application of the photosensitizer as well as in the mode and intensity of sensitization. They also differ in the effectiveness and durability of treatment (20–90%). Such large discrepancies may result from the ineffective application of the photosensitizer to the tissue covered with thick keratosis, discrepancies in the mode and intensity of photosensitization, and the diversity of disease cases.

Objectives. The aim of the study was to examine the effectiveness and durability of photodynamic therapy in the treatment of persistent, thick and extensive oral keratoses, and to develop a treatment protocol taking into account the frequency and number of treatments as well as the control of the dose of the applied photosensitizer and the intensity of photosensitization.

Materials and methods. Two patients with thick and extensive oral keratosis were treated. In both cases, keratotic changes were permanent, months-long and thick. In the first case, they occurred on the lower gingiva and had not been previously treated. In the second case, keratotic lesions were located on the lower right gingiva, on the tongue and in the floor of the mouth. The patient had previously undergone cryotherapeutic procedures many times and unsuccessfully. Due to the recurrence of the disease and numerous scars, the therapy was discontinued and the patient was referred for PDT treatment. The PDT treatments of thick keratoses were preceded by multipoint laser deepitalization (MLD) of keratosis in order to increase the effectiveness of photosensitizer penetration into the tissue. The dynamics of changes and the target level of photosensitizer concentration in the tissue during photosensitizer application and photosensitization were monitored. Changes in the photosensitizer concentration in the tissue during photosensitizer application and photosensitization were monitored.

Results. In both cases, the lesions were completely healed with a very good esthetic effect. Complete treatment required 9–11 PDTs and 2 MLDs over 2–3 months. The follow-up period was 9–12 months.

Conclusions. The MLD-assisted photodynamic therapy is effective in the treatment of thick and extensive keratotic lesions of the oral mucosa. The treatment is permanent.

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Spectroscopic and texture analysis by cone beam computed tomography of dentin modified with Nd:YAG laser

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Abstract

Objectives. The aim of this study was to evaluate the influence of the Nd:YAG laser associated or not associated with a new Curaprox black toothpaste-based photoabsorber on the chemical structure of dentin, through spectroscopic analysis (FTIR) and texture analysis by cone beam computed tomography (CBCT).

Materials and methods. Thirty specimens of bovine incisor crowns were obtained and embedded in acrylic resin. Each sample was ground and polished with sandpaper until the exposure of the dentin surface, followed by the demarcation of 2 circles on these surfaces using a 3-mm diameter trephine drill, one close to the incisal and the other close to the cervical region of the tooth, to establish regions separated in dentin for different interventions in the same specimen. From the demarcations, 4 groups were obtained (n = 15): GC – control group (no surface treatment), GL – laser group (Nd:YAG laser 60 mJ/pulse, 10 Hz, 48 J/cm^2, with contact and scanning for 60 s), GF – photoabsorber group (application of photoabsorber for 60 s, followed by abundant washing), GLF – photoabsorber group + laser (photoabsorber application + Nd:YAG laser 60 mJ/pulse, 10 Hz, 48 J/cm^2, with contact and sweep for 60 s). Afterwards, the samples were submitted to chemical analysis by means of FTIR, where the spectra with the transmittance peaks of the main elements were collected. The specimens were then submitted to a CBCT in order to analyze the texture parameters.

Results. Compared to the GC, in the GL there were changes in carbonate, phosphate and mainly amide groups. Regarding the GLF, the amide peaks were similar to the GL, but with differences in the phosphate and carbonate peaks. In the GF, there was an intermediate profile, with few changes. Meanwhile, in terms of texture, modified dentin showed significant difference among the groups in comparison to those not submitted to laser irradiation.

Conclusions. Laser irradiation promoted significant changes in chemical composition and texture of the substrate. However, the new associated photoabsorber was not able to potentiate the action of the Nd:YAG laser on dentin.

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Interdisciplinary reconstruction of the lower face in two elderly patients

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Abstract

Objectives. The aim of the study is to present the effects of successful reconstruction of the lower face in 2 elderly patients. The patients underwent comprehensive dental treatment followed by Nd:YAG and Er:YAG laser procedures.

Case description. The paper presents a multi-stage procedure. After initial examination and diagnosis, the patients underwent dental hibernation and sanitation of the oral cavity in order to eliminate caries and odontogenic inflammations. Then, the patients were presented with an individual plan of conservative and prosthetic treatment, which they accepted. Missing teeth were reconstructed and the occlusal height was rebuilt. As a result of the treatment, stomatognathic function and smile have been improved.
In the next stage, laser treatment was planned to tighten the existing collagen and stimulate new collagen, restore the elasticity of the skin including smoothening of smoker's lines, adding volume and lifting the corners of the lips, reduce visible wrinkles and tighten the skin, and as a result, change the shape of the lower face.
Case 1: The patient was a 76-year-old woman who has shown multitudes of deep wrinkles and smoker's lines, loose skin of lower part of the face and lack of lip volume, skin severely damaged and hyperpigmented by UV rays after excessive sunbathing.
Case 2: The patient was a 72-year-old woman who has shown saggy skin, multitude of wrinkles, lack of volume around cheeks area due to inadequate dentition and small, narrow lips.
Parameters: In both cases a mixture of Er:YAG and Nd:YAG lasers were used.
1. Er:YAG, intra-oral, PS03, 7 mm, 6 J, 1.5 Hz
2. Nd:YAG, rejuvenation, R33, 10 mm, 8 J, 6 Hz
3. Nd:YAG, collagen stimulation, R34, 20 mm, 100 J, 5 s
4. Er:YAG, hot peel (skin resurfacing), R11, 5 mm, 3 J, 3 Hz

In total, 5 treatments of 1), 2) and 3), and 2 treatments of 4) were performed over the period of 1 year and the final results were observed 3 months after the last treatment.

Discussion. People around the world are living longer and the vast majority of adults can expect to live decades after retirement. Longer life brings new challenges, including health ones. Patients in their later years of life want to feel good and look healthy. Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Health is also defined as the body's ability to adapt to new hazards and disabilities. The facial appearance changes with increasing age. The loss of supporting bones – maxillary and mandibular atrophy, the alveolar ridge resorption, loss of periodontal tissue and teeth greatly affects the covering soft tissue of the face. The result of the above changes are: dysfunction of the entire stomatognathic system and its further consequences, the formation of wrinkles, compensatory mechanisms of the mimic muscles, a dramatic change in the shape and profile of the face and its old appearance. In planning a good final effect of treatment, the reconstruction of missing teeth and the improvement of occlusal conditions are the first necessary steps.

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Laser skin treatments and resurfacing have become a gold standard option for the rejuvenation of facial skin texture, tone and elasticity. Additionally, Nd:YAG and Er:YAG laser procedures affected the skin, regenerating and stimulating new collagen production and tightening, which in turn resulted in additional volume observed in the treated areas.

Very good and long-lasting effects were obtained. The patients rated the results at 9.5/10, being satisfied with the lack of complications, no downtime and no pain during the 1), 2) and 3), and a short 5-day recuperative period after 4) hot peel without any complications.

The procedures are safe, clinically effective and satisfactory for patients.

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The use of TBO-mediated aPDT in the treatment of oral lichen planus: A case series

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Abstract

Oral lichen planus (OLP) is a chronic, mucocutaneous, inflammatory disease of unknown etiology. Typically, the course of the disease includes exacerbations and remissions.

Clinically, OLP ranges from mild, painless white forms (reticular, papular, plaque-like) to severe, painful, red forms (erosive, atrophic, bullous). Conventional treatment of symptomatic types of OLP involves topical application of corticosteroids, however, prolonged steroid therapy carries the risk of side effects, which prompts the search for new, effective and safe therapy methods.

The aim of this report is to present the treatment of the symptomatic forms of OLP with the use of antimicrobial photodynamic therapy (aPDT) as an alternative method.

Two women, both with the bullous – erosive form of OLP, were referred to the Department of Periodontal Diseases and Oral Mucosa Diseases, Zabrze. In the 72-year-old patient, lesions were located on the dorsal surface of the tongue and the 57-year-old patient had lesions on the left buccal mucosa in the 36/37 teeth area. The diagnosis of OLP was confirmed clinically and histopathologically.

Having excluded any contradictions, the patients were qualified for the aPDT cycle. The protocol included the use of toluidine blue (TB) as a photosensitizer and irradiation of the lesions on the mucosa with the Smart M Pro® diode laser (Lasotronix, Piaseczno, Poland), characterized by a 635-nm wavelength and an 8-mm-diameter optical fiber for a period of 38 s per point, as well as the output power of 400 mW and fluency of 30 J/cm^2. The patients underwent 6 sessions of aPDT at weekly intervals – a total of 6 weeks of therapy.

During the clinical examination, 1 month after the last irradiation, complete healing of the lichen planus lesions was observed in both patients. Therefore, the patients reported a complete relief of pain in the affected areas.

Clinical observations confirm high effectiveness of TBO-mediated aPDT combined with a diode laser of 635 nm wavelength in the treatment of advanced forms of OLP.

Thus, this alternative technique is worth considering in monotherapy or as a supplement to conventional therapies.

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Evaluation of sensitivity of selected Candida strains to ozonated water using the MTT test at the wavelength of λ = 550 nm

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Abstract

Background. Oral candidiasis is a huge clinical problem. When the balance between commensal fungi and host defense mechanisms is disturbed, opportunistic infection develops. The overlapping risk factors for fungal infections have resulted in the number of Candida infections increasing dramatically over the last few decades. Recently, we have seen difficulties in the treatment of fungal infections due to the resistance of strains. For this reason, there is a need to search for alternative methods of treating these infections. Among the strains causing infections, *C. albicans* is the leader, but an increasing number of infections with non-albicans strains is observed. Ozone is an allotrope of oxygen, which has very strong oxidizing properties, which determines its activity against pathogenic microorganisms. These studies are a continuation of earlier ones.

Objectives. The purpose of these studies is to evaluate the antifungal effects of ozone in water form on non-albicans strains, i.e., *C. glabrata* ATCC 66032 and *C. krusei* 14243, and to compare them to the reference strain, which was *C. albicans* ATCC 10231.

Materials and methods. The effectiveness of the antimicrobial effect at time "zero" (the time of the shortest possible exposure), after 30 s and 120 s of exposure to ozonated water at a concentration of 5 µg/mL and 50 µg/mL was evaluated using the MTT test. The number of live was assessed by the quotient of the absorbance of the test sample and the absorbance of the control sample. In this case, the absorbance was determined at the wavelength of λ = 550 nm using the Eon™ microplate spectrophotometer by BioTek. Then, statistical calculations were performed.

Results and conclusions. The experiment confirmed the effective operation of ozonated water. The antimicrobial effect is enhanced with increasing exposure time and increasing the concentration of the substance.

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The application of multi-wave diode laser for the removal of lipoma by using mucosal preservation technique: A case report

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Abstract

A lipoma is a benign tumor composed of adipocytes. It is one of the most common mesenchymal tumors. Tissue trauma is considered its most common root cause. What is more, genetic factors and comorbidities are taken into account for other etiological factors. An appearance resembling a tumor located on the cheek may in fact be a herniated fat pad in the buccal muscle. Other locations of the lesion may be tongue, floor of the mouth and lips. The gold standard is a surgical treatment and other methods, such as laser techniques, which may be an alternative in some cases. The aim of the paper is to describe a case of a lipoma of the tongue mucosa and present treatment method using a diode laser. A 57-year-old female patient reported to the Department of Periodontal and Oral Mucosa Diseases, Department of Conservative Dentistry and Endodontics, Medical University of Silesia in Zabrze, in order to consult a tumor-like lesion on the dorsal surface of the tongue. The lesion was qualified for surgical treatment, and after discussing different techniques with the patient, consent was obtained for laser treatment using the mucosal preservation technique (MPT). The surgery was performed with a 980-nm diode laser (average power: 4 W, modulated mode, pulse time: 100 µs, pause time: 100 µs, 50% duty cycle, 320 µm optical fiber, contact method).

After local anesthesia of the surrounding tissues with articaine hydrochloride and the addition of adrenaline at 1:200,000, a vertical incision of the covering tissues was done. The incision was just below the highest point to expose the tumor capsule. The next step was to separate lesion with a raspator and a laser applicator from the surrounding tissues. Then, the coagulated wound was left without suturing. After the excision, in order to improve the wound healing, a photobiomodulation cycle was used with a 635-nm laser (output power: 100 mW, fluence: 3 J/cm^2, operating mode: CW, time of single irradiation: 30 s) with the use of an 8-mm glass applicator with the contact method. The material was sent for histopathological examination. Satisfactory results were obtained: mild postoperative afflictions and healing without complications. No side effects, such as deficiencies in mobility or sensory disturbances of the tongue, were observed. The presented MPT technique allows to execute an efficient procedure. The MPT enables layer preparation of soft tissues and helps maintain homeostasis during the treatment. To preserve the tissues which are covering the lesion, it is necessary to assemble the sutures.

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Evaluation of the antifungal effect of the Er:YAG laser in relation to yeast most often causing oral candidiasis: An in vitro study

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Abstract

Objectives. This study examined the antifungal effect of the Er:YAG laser on the yeast most commonly causing oral candidiasis.

Materials and methods. After spreading the yeast suspension of *Candida (C.) albicans: C. albicans* ATCC 10231, *C. parapsilosis* ATCC 22019, *C. tropicalis* ATCC 66029, and *C. kefyr* ATCC 2512 on Sabouraud agar plates, a single pulse Er:YAG laser (AdverEvo, Morita, Japan) was immediately applied. The laser was used with a glass, flat laser tip C 800 F (diameter: 0.08 cm), with different energy (from 30 mJ to 400 mJ), with a single pulse time of 300 µs, from a 10-mm distance (laser handpiece was mounted on the rack). Four repetitions (n = 4) were done for each energy and each used Candida strain. The growth of the yeast colonies on lased agar plates was examined after anaerobic culture after 24, 48, 72, 96, and 120 h. The size of the zone of growth inhibition after 24 h of observation and the number of colony forming units (CFUs) within this zone were measured at 5 scheduled observation times. The obtained results were statistically processed.

Results. Growth inhibitory zones were found at all irradiated sites and at all yeast strains.

Conclusions. The obtained results suggest that the Er:YAG laser has a high antifungal potential even at low power parameters.

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Is pain-free conservative treatment with Er:YAG laser possible without anesthesia?

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Abstract

Background. The clinical report shows the application of Er:YAG laser (MORITA, Kioto, Japan) to remove dental caries in deciduous, permanent immature, and permanent teeth of 3 children.

Materials and methods. The paper describes the caries treatment of generally healthy patients who did not use any anti-inflammatory drugs for 1 month before the procedure. Before the treatment, occlusal caries and tangential surfaces were detected by DIAGNOcam (Kavo, Biberach, Germany) device. The Pulp Vitality Tester (Parcell, Edgewood, USA) was applied to check dental pulp vitality. The device assesses the pulp vitality on a scale from 0 to 80 µA (0–40 µA – vital pulp; 40–80 µA – pulpitis; over 80 µA – necrotic pulp). The following parameters of Er:YAG laser were used to treat caries: for occlusal surface caries decay of primary 85 (FDI) tooth in 5 years and 9-month-old male (enamel: tip C600F, 10 Hz, 350 mJ and tip C400F, 10 Hz, 180 mJ; dentin: tip C600F, 10 Hz, 180 mJ; enamel surface modification: tip C600F, 20 Hz, 70 mJ; air: 7, water: 7 (2.5 mL/min)); for proximal caries decay of permanent immature 25 (FDI) tooth in 13 years and 6-month-old male (enamel: tip C600F, 10 Hz, 250 mJ; dentin: tip C600F, 10 Hz, 180 mJ; enamel surface modification: tip C400F, 20 Hz, 50 mJ; air: 7, water: 7 (2.5 mL/min)); for proximal caries decay of permanent 12 (FDI) tooth in 10-year-old male (enamel: tip C600F, 10 Hz, 250 mJ; dentin: tip C600F, 10Hz, 150 mJ; enamel surface modification: tip C600F, 20 Hz, 70 mJ; air: 7, water: 7 (2.5 mL/min)). The caries treatment was performed without local anesthesia. The final result of pain was evaluated based on the visual analogue scale (VAS) pain scale.

Results. All the patients did not feel pain during the laser treatment (VAS score: 0). The results of the pulp vitality measured by using the pulp tester before and after the treatment were 27 µA and 30 µA, 23 µA and 30 µA, 25 µA and 25 µA, for the first, second and the third patient, respectively.

Conclusions. The application of the Er:YAG laser in 3 different patients allowed to treat the caries in deciduous, permanent immature, and permanent teeth without pain sensation. Preparation of a carious cavity with the Er:YAG laser is safe in terms of maintaining the vitality of the tooth pulp.

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One-year observation of changes in the occlusion of a 12-year-old patient after laser frenulectomy of tongue frenulum performed with a 2940-nm Er:YAG laser, without orthodontic treatment, but with the use of myofunctional therapy of the tongue

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Abstract

Objectives. To present changes in the occlusion of a patient with malocclusion, before and after laser frenulectomy, without orthodontic treatment, with myofunctional exercises of the tongue.

Case description. A 12-year-old patient visited the dental office in Niebylec to correct the ankyloglossia. The interview showed that the child practiced pronunciation with a speech therapist for 4 years without any visible improvement. Examination revealed the presence of a thick, inflexible, non-transparent frenulum of the tongue, visible from the alveolar process. The free part of the tongue was 7 mm according to the Kotlow Classification Class 3, severe ankyloglossia, and according to the Marcheasan protocol, the difference in mouth opening was 30% – improper result. The child had tongue dysfunction, incorrect rest position of the tongue, keeping the tongue between 2 dental arches, persistent infantile type of swallowing, anterior open bite complicated by a crossbite on the left side, shift of the midline. The patient underwent frenulectomy using a 2940-nm Er:YAG laser (AdvErL EVO, Morita, Japan) with the following parameters: 80 mJ, 20 Hz, water 4 mL/min, air/yes, tip: 0.8 mm, pulse duration: 300 µs, average power: 1.6 W, energy density per pulse: 16 J/cm^2, peak power: 266.6 W, average power density: 318 W/cm^2, and additional functional therapy in accordance with the developed protocol of myofunctional exercises, which was initiated a week before the procedure and continued 3 months after the surgery. The patient was followed up for 12 months after the procedure. Photographic documentation and control visits were conducted before surgery, and at 1, 3, 6, 12 months after the procedure.

Discussion. Ankyloglossia, commonly known as tongue-tie is the most common tongue morphology disorder characterized by an incorrectly attached (too short and/or thickened) frenulum of the tongue. Ankyloglossia impairs tongue movements, which can cause speech, swallowing, breathing, sleep, and even posture problems. Ankyloglossia is often associated with craniofacial growth abnormalities and orthodontic anomalies, and despite the clear biological plausibility of this hypothesis, little evidence is available to link these issues.

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Comparison of the length of the free part of the tongue according to the Kotlow classification and the difference in the mouth dilation according to the Marchesan protocol in preschool and elementary children before and after frenulectomy performed with surgery using a 2940-nm Er:YAG laser

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Abstract

Objectives. The purpose of this study was to evaluate the length of the free part of the tongue according to the Kotlow classification and the difference in the mouth dilation according to the Marchesan protocol in preschool and elementary children before and after frenulectomy performed with surgery using a 2940-nm Er:YAG laser.

Materials and methods. Ten patients diagnosed with moderate or severe ankyloglossia (6 female and 4 male; age: 4–11 years; mean age: 7 years and 6 months) were enrolled in the study. The subjects were randomly divided into 2 groups: G1 (test group; 5 children: 3 female, 2 male), G2 (control group; 5 children: 3 female, 2 male). The G1 group consisted of children who underwent frenulectomy with the Er:YAG laser (AdvErL EVO, Morita, Japan) at the following parameters: 80 mJ, 20 Hz, water: 4 mL/min, air/yes, applicator: 0.8 mm, pulse duration: 300 µs, average power: 1.6 W, energy density per pulse: 16 J/cm^2, peak power: 266.6 W, average power density: 318 W/cm^2; an additional myofunctional therapy was performed 1 week before and 3 months after the frenulectomy. In the control group, only myofunctional therapy (without frenulectomy) was prescribed. Furthermore, dilation tests according to the Marchesan protocol (percentage scale) with the electronic caliper (03-15401, BGS technic, Germany) and the measurement of the free part of the tongue with the calibrated periodontometer (DD.721.131, Falcon, Poland) or ruler were conducted.

Results. Improvements in the Kotlow classification score (from 3 and 2 to 1 or 0 grade, 1 month and 3 months after) and in the percentage difference in dilation (the Marchesan classification) from the mean range of 44.2% to 55.8%, 1 month after, and to 59.2% 3 months after in the G1 group. In the control group, the results for Kotlow did not change, and the changes in the Marcheasan measurements were not significant.

Conclusions. Lengthening of the free part of the tongue and improvement in mouth dilation were obtained in the group combining laser treatment and myofunctional therapy.

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Evaluation of the red/orange autofluorescence of selected Candida strains in the light of a 405-nm diode laser: Direct observation

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Abstract

Background. Many studies showed the presence of red/orange fluorescence (R/OF) in the oral cavity and correlated it with the presence of either cariogenic bacterial plaque, which is associated with gingivitis and periodontitis, or bacterial plaque which is present on the dorsal part of the tongue. *Candida* spp. frequently present in both biofilms are suspected to be one of the causes of R/OF.

Objectives. To detect R/OF during direct observation of 144-hour-old colony growth of selected Candida strains in the light of a 405-nm diode laser.

Materials and methods. This research was carried out on the following strains: *C. albicans* ATCC 601936 and ATCC 10231, *C. glabrata* ATCC, *C. parapsilosis* ATCC 20019, *C. krusei* ATCC 34135.

Study groups. The 10-µL aliquots of *Candida* suspension were transferred 9 times onto a Sabouraud dextrose agar plate. Four plates were prepared, with one for each test strain. Plates were incubated. The control groups were: Qdot 655, and 685 probes made from nanocrystals of semiconductor material with R/OF. The light source: a 405-nm diode laser (CW), output power – 250 mW, applicator – 12-mm diameter, fluence – 15 J/cm^2, power density – 0.25 W/cm^2. The laser handpiece was fixed on a rack and illuminated the plate surface from 34 cm, in darkness. The plates were photographed with a camera with a yellow filter. Documentation was taken after 48, 72, 96, 120, and 144 h of incubation. The evaluation of the minimum and maximum color hue of the strains and the evaluation of the color distribution in the colony were made.

Results. The obtained results indicate the presence of R/OF within all 9 colonies of *C. albicans* ATCC 601936, *C. albicans* ATCC 10231 and *C. glabrata* 66032 at all times of observation. The assessed phenomenon intensified between 48 and 72 h of observation in both strains and then remained at the same level until 144 h. The visible autofluorescence was still characterized by the more intense rim and less intense center. Daily growth of colonies did not have R/OF. The *C. parapsilosis* ATCC 20019 strains showed no autofluorescence in any of the colonies and at any time of observation.

Conclusions. The majority of the tested *Candida* strains have R/OF under 405-nm light.

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Antimicrobial photodynamic therapy over cariogenic biofilms with the use of ETNBS and BPD

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Abstract

The susceptibility of multispecies cariogenic biofilm (*S. mutans*, *S. sobrinus* and *A. naeslundi*) to antimicrobial photodynamic therapy (aPDT) was evaluated using ETNBS and BPD (PSs) at 5, 10, 20, 40 and 80 μM irradiated by a red laser at 635 nm and 690 nm under 10, 30 and 60 J/cm^2 and 5 min of pre-irradiation time. The mechanisms of aPDT were also assessed. Biofilms were cultured in BHI+1% sucrose (*S. mutans* and *S. sobrinus*) and Actinomyces (*A. naeslundi*) broth for 3 days in a 96 well-plate. Serial dilutions were seeded onto BHI and Actinomyces agar to determine viability by colony forming unit (CFU) counting. The metabolism of the biofilm by XTT and confocal laser scanning microscopy (CLSM) was performed using BacLight® LIVE/DEAD and Dextran Alexa Fluor™ 647. Different groups were evaluated: L–D– (negative control), L–D+ (drug), L+D– (light), L+D+ (PDI), and chlorhexidine at 0.12% (positive control). Two-way analysis of variance (ANOVA) and Tukey's test ($p < 0.05$) were performed. Qualitative analyses were obtained as to the distribution of non-viable/viable after treatments. Statistically significant difference was observed for aPDT and chlorhexidine groups compared to negative and light controls ($p < 0.05$). Antimicrobial photodynamic therapy using ETNBS and BPD can be an adjunct and effective method to control cariogenic biofilm.

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Using the principles of periodontics and occlusion to restore form, function and esthetics

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Abstract

Objectives. To correct the occlusion, periodontal bone loss and esthetics of the patient using the principles of periodontics and occlusion with the goal of bringing the patient back to a maintainable state of health.

Case description. A 61-year-old female patient reported to the graduate periodontics clinic with the chief complaint of "My teeth are moving in the front." Upon examination, the patient exhibited localized 90% bone loss on tooth #30, 26 and 9, generalized staining, occlusal interferences, and supra-erupted and buccally displaced tooth #9. Previously, the patient had been told that teeth #30, #26 and #9 must be extracted and replaced with implants, but the patient wanted to save her natural teeth.

Discussion. This case demonstrates that periodontally hopeless teeth can be maintained using the combination of non-surgical therapy, Er:YAG laser treatment, occlusal adjustment, a modified Hawley Bite Plane, and regenerative surgery in order to provide a stable, functional and esthetic result.

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Assessment of wound healing at the donor site after FGG procedure and using methods supporting tissue regeneration

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Abstract

Background. Autogenous soft tissue grafts are recommended for the augmentation of the gingiva. The most frequently reported complications during free gingival graft (FGG) procedures are: postoperative pain, edema and bleeding. Although various methods have been proposed to protect exposed areas at the donor site, there is currently no gold standard for post-operative treatment. In the era of the development of modern dentistry, more and more often innovative methods are sought to support and accelerate the treatment process. Such methods include laser biomodulation, the use of hyaluronic acid or advanced platelet-rich fibrin (A-PRF).

Objectives. The aim of the study was to evaluate the effect of 3 methods supporting tissue regeneration (laser biomodulation, non-cross-linked hyaluronic acid Gengigel 0.2%, A-PRF) on wound healing at the donor site after FGG procedure. Subjective feelings of the patient before and after the procedure were also assessed using the visual analogue scale (VAS).

Materials and methods. Patients of the Clinic of the Department of Periodontal Diseases and Oral Mucosa of the Medical University of Silesia in Katowice, with a branch in Zabrze, were qualified for the study. All patients underwent the deepening of the oral vestibule and widening of the narrow zone of the gingiva with the standard procedure of FGG. In 3 study groups and the control group, the treatment procedures were performed in 48 patients (12 patients per group) of both sexes, aged between 18 and 60 years. Patients were randomized to one of the 3 treatment groups or to the control group using the block randomization method. Study group I – the postoperative wound was subjected to laser photobiomodulation (PBM) immediately after the procedure and periodically for the next 6 days (diode laser SMARTm PRO laser from Lasotronix (Piaseczno, Poland), wavelength: 635 nm, output power: 100 mW, fluence: 3 J/cm^2, continuous wave mode (CW), single irradiation time 30 s, contact method, point by point. Study group II – healing supported by the use of the hyaluronic acid preparation Gengigel 0.2% (Ricerfarma, Milan, Italy) by applying to the wound 3 times a day for 6 days from the first day after the procedure. Study group III – wound healing supported by the use of A-PRF. Control group IV – physiological healing. Within 2 weeks from the procedure, patients reported for follow-up visits on the 1st, 7th and 14th day. On the 7th and 14th postoperative days, the healing of the recipient wound was objectively assessed according to the Early Wound Healing Index (EHI). Also, after the procedure, patients subjectively assessed pain and discomfort (swelling) at the donor site on the 1st, 2nd, 4th, 7th, and 14th day after the procedure by using a questionnaire prepared according to the 10-point VAS scale.

Results. On day 7 after the procedure, the best healing was observed in group 1 and 3, in which 91.67% of the examined healed at the level of EHI = 2. On day 14 after the procedure, the best healing results (EHI = 1) were also obtained in groups 1 and 3, and the worst results were observed in group 2 (EHI = 2 in 41.67% of patients) and in group 4 (EHI = 2 in 33.33% of patients). In the case of the donor site, the highest pain was observed on day 2 and day 4 in group 2 (66.67% of patients in the group determined VAS at the level of 6 on day 2, and on day 4 the same result was reported by 83.33% of respondents). At the level of VAS = 3,

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pain persisted in 75% of patients in group 2 and in 91.67% of patients in group 4 on day 7, postoperatively. The weakest complaints in this period (VAS = 1) were reported by 83.33% of patients in group 1. On day 14, patients did not report any pain in the entire group 1 and 3. When assessing the discomfort/swelling at the donor site, the highest VAS values were observed on the 2nd postoperative day in patients from groups 2 and 4. On the 4th and 7th days, a decrease in negative sensations was observed in all groups. On day 14, patients, mainly from the control group, reported slight discomfort (VAS = 1).

Conclusions. A positive effect of laser biomodulation and A-PRF on wound healing in the donor site was observed compared to the study group with HA and the control group. Based on the analysis of data obtained from pain and discomfort assessment surveys at the donor site, the best tolerance to postoperative sensations was found in the case of A-PRF fibrin and laser biomodulation. The symptoms decreased over time.

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Assessment of the uptake of ortho-toluidine blue or curcumin into *Candida* spp. cells at various time intervals: A preliminary study

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Abstract

Background. Due to an increased number of immunocompromised patients, the infections associated with the *Candida* spp. increased in recent years. A modern antimicrobial photodynamic therapy (aPDT) has been presented as a potential antifungal therapy.

Objectives. The aim of this study was to determine the optimal incubation time needed for the absorption of toluidine blue ortho (TBO) or curcumin by the cells of selected *Candida* strains by direct observation under a light microscope.

Materials and methods. Briefly, 0.05 mL of standard strains of *C. albicans* ATCC 10231, *C. glabrata* ATCC 90030, *C. krusei* ATCC 6258, *C. parapsilosis* ATCC 90018, *C. tropicalis* ATCC 750 or *C. dubliniensis* ATCC 646 (density – 0.5 McFarland) suspensions was transferred to a glass slide followed by a 0.005 mL of TBO (FotoSan, CMC Dental, Rosiev, Denmark) or curcumin with riboflavin (QroxB2; CMC Dental, Rosiev, Denmark). The samples were analyzed under a Nikon Eclipse 80i – light microscope (Nikon, Japan) at a x600 magnification. Photographic documentation was made before photosensitizer (PS) addition (used as a control group) and after 30 s and 1, 3, 5, 7, 9, 11, and 15 min of exposure to the PS on *Candida* spp. (study groups). The morphometric method was used to assess the uptake of TBO or curcumin with riboflavin, consisting in counting the percentage of cells with dye in the field of view of the microscope. We performed 3 replications for all tested strains.

Results. The presence of *Candida* cells containing TBO was observed in all the strains and at all sampling times. *C. albicans* ATCC 10231 showed the fastest MB absorption (100% in 7 min). All non-*albicans Candida*, especially *C. parapsilosis* ATCC 90018 showed reduced MB absorption (90% only after 9 min and 100% after 12 min).

Conclusions. The most appropriate incubation time for selected *Candida* strains is a period of 9–11 min.

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Efficacy of antimicrobial photodynamic therapy with TBO and curcumin in the elimination of *Candida albicans* biofilms on acrylic plates: Preliminary in vitro study

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Abstract

Background. Denture-related stomatitis (DRS) is a chronic inflammation of the oral mucosa associated significantly with *Candida albicans* infection. Conventional therapy in this entity is focused on targeted antimycotic therapy. However, there is a need to develop alternative treatment protocols that can provide equally good therapeutic effects. Antimicrobial photodynamic therapy (aPDT), based on the interaction of a photosensitizer, light of a specific wavelength and oxygen enables an effective elimination of pathogens.

Objectives. The aim of this study is to evaluate the efficacy of aPDT involving a combination of 405-nm diode laser light with curcumin (Curenext oral gel; Abbott Healthcare Pvt., Ltd., Mumbai, India) and to compare this protocol with a combination of 635-nm diode laser with ortho-toluidine blue (PAD Smart Solution; Denfotex, London, UK) in the elimination of selected Candida strain cultured on acrylic plates.

Materials and methods. An in vitro study was conducted on 20 acrylic plates, previously contaminated with *C. albicans* organisms. Contaminated plates were randomly divided into 4 groups, as follows: negative control (NC): without any treatment; positive control (PC): treated with 0.2% chlorhexidine solution; aPDT1 (S1): treated with 635-nm diode laser (400 mW, 24 J/cm^2, 30 s) and ortho-toluidine blue; aPDT2 (S2): treated with 405-nm diode laser (30 mW, 10 J/cm^2, 60 s) and curcumin gel. Results in each group were assessed by swabbing the acrylic plates after treatment, culturing organisms on an appropriate microbial medium and counting of colony-forming units (CFUs) afterwards.

Results. Reduction in CFUs was significant in both study (S1, S2) and positive control groups (PC). There were no significant differences between study groups and positive control.

Conclusions. Both aPDT variants using ortho-toluidine blue and curcumin appear to be promising methods of eliminating *C. albicans* organisms from the surface of acrylic plates.

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The use of erbium laser for debonding ceramic veneers: A case report

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Abstract

Background. Erbium lasers are a fantastic technology with many applications in dentistry, and lately they have been a routine in dental offices for removing veneers. The most common causes for replacement of veneers are discoloration, caries lesions, fracture, microleakage, gingival recession, and the lack of patient's satisfaction with the outcome of their smile. Replacing ceramic veneers can be very challenging and the conventional way for their removal by grinding these restorations with high-speed diamond burs. This procedure is time consuming and has a risk of damaging the underlying tooth structure because of the similarity of colors between the tooth, the resin cement and the restoration. Also, the hardness of the ceramics makes this procedure more complex.

Case description. In this case report, the patient was seeking for retreatment due to teeth sensitivity following veneers placement. After a thorough examination, scanning and X-ray exams, the replacement of these veneers was recommended in order to achieve better sealing of the tooth structure since there were many gaps between the tooth and the porcelain veneers. Besides sensitivity, the patient also complained of jaw pain, and it was observed that the overjet/overbite was worse with these veneers. Full mouth rehabilitation was performed and all the ceramics had to be removed. All veneers were removed with the Er:YAG laser. The protocol used was the one preset at the equipment for veneer removal (4 W, 20 Hz and 200 mJ) and it was applied until the veneer debonded with the laser irradiation or with the help of a dental instrument to detach the veneer from the tooth. After the treatment, patient stopped feeling tooth sensitivity and was very satisfied with the experience using laser for debonding the ceramics.

Discussion. Erbium lasers enabled an easy removal of the porcelain veneers, becoming the most suitable alternative for this procedure. The light emitted by the laser is transmitted through the ceramic and selectively absorbed by water molecules and residual monomers in the resin cement interface. Many studies have reported ceramic removal without damaging the underlying tooth structures and sometimes without even breaking the veneer. The laser energy causes a thermal ablation and photoablation producing hydrodynamic vaporization and ejection of the resin cement, causing a thermal softening of the cement which reduces bond strength and enables removal of these restorations. Studies have verified the effectiveness and practicability of erbium lasers for debonding ceramics. Understanding the protocols using the laser is very important and protocols with less energy are indicated.

Conclusions. The use of erbium lasers for veneer removal is a promising technique compared to traditional method, being the most suitable alternative for the dentist and for the patient. Laser treatment is preferred by the patients because it is a non-contact treatment that causes less sensitivity and removes the veneers faster than the conventional method, at the same time preserving the remaining teeth.

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The use of 2940 nm and 635 nm with toluidine blue in the elimination of halitosis: Is it possible? Description of a case series

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Abstract

Background. Halitosis is a bothersome and widespread discomfort in the mouth. It affects 31.8% of the human population and tends to increase. The cause of halitosis is bacteria and their metabolic products (volatile sulfur compounds; VSCs). In a clinical report, the use of different laser wavelengths in the diagnosis and treatment of halitosis in healthy patients was presented.

Materials and methods. The fluorescence method using the laser with a laser wavelength of 405 nm (SmartM PRO, Lasotronix, Poland) was a criterion for assessing the tongue's appearance of 2 healthy non-smoking patients (1 male and 1 female) with good oral hygiene, no caries and no oral mucosa inflammation with halitosis. The level of VSCs was measured by the halimeter device (AI Analytical Innovations GmbH, Germany). The mouth odor sensation determined by the patient was assessed by the operator using the visual analog scale (VAS). Microbiological analysis of the dorsal part of the tongue was conducted using a biological-molecular test (PetPlus, MIP Pharma, Germany) before and 2 weeks after treatment.
The male patient treatment: antimicrobial photodynamic therapy (aPDT) with a 635-nm diode laser (SmartM PRO, Lasotronix, Poland) and toluidine blue dye (TBO), which was applied to the dorsal of the tongue for 4 min, afterward it was activated with the diode laser at following parameters: energy: 400 mJ, dose: 24 J/cm^2 per point, t: 30 s per point, handpiece diameter: 8 mm, surface area: 0.5 cm^2, points = 9, distance: 3 mm.
The dorsal part of the tongue of the female patient treatment was debrided using 2940-nm Er:YAG laser (LiteTouch, Light Instruments, Israel) at following parameters: energy: 80 mJ, frequency: 15 Hz, power: 1.2 W, tip size: 1 × 1.7 mm, distance: 3 mm.
Follow-up visits were made 2 weeks, 1 month and 2 months after laser treatment.

Results. The Er:YAG and aPDT with the diode laser and TBO reduced the total amount of bacteria after 2 weeks. In both cases, the patients showed an improvement in the quality of their breath (mouth odor sensation) from severe to a mild level of discomfort. The concentration of VSCs in the mouth decreased from 374 ppb to 30 ppb (aPDT) and from 846 ppb to 35 ppb (Er:YAG laser) measured after 2 months. No significant changes in the coating on the tongue were observed.

Conclusions. A combination of different laser wavelengths is an effective method for treating oral malodor.

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Effectiveness of treatment combining topical fluorides and diode lasers on remineralization of enamel caries: A systematic review and meta-analysis

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Abstract

This study aims to compare the effectiveness of treatment combining topical fluoride and diode laser with single use of fluoride on remineralizing enamel caries. We performed literature search on Scopus, Web of Science and PubMed. The following keywords were used: (diode lasers) OR (diode laser) OR (quantum cascade laser) OR (quantum cascade lasers) OR (Gallium Aluminum Arsenide lasers) OR (Gallium Aluminum Arsenide laser) OR (GaAlAs lasers) OR (GaAlAs Laser) OR (semiconductor laser) OR (semiconductor lasers)) AND ((caries) OR (dental caries) OR (remineralization) OR (remineralization)) AND fluoride. Three hundred and eight relevant articles were identified with 29 duplicated articles removed and 255 irrelevant articles excluded after screening. Twenty-four full-text articles were assessed for eligibility and 3 studies were finally included in the systematic review and meta-analysis. These laboratory studies used 910–980-nm diode lasers with various fluoride agents, and they measured microhardness of enamel. A meta-analysis comparing F&L with F on microhardness of demineralized enamel showed a standard mean difference of 1.06 (confidence interval (CI): 0.12 to 2.00, $p = 0.03$ with high heterogeneity ($I_2 = 83\%$, $p < 0.0001$)). In conclusion, diode lasers enhance the effect of fluoride on remineralizing enamel caries. However, substantial heterogeneity was found among the studies, and the results should be interpreted with caution.

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Immunohistochemistry of cytokeratin proteins 10 (CK10) and 14 (CK14) demonstrates that photobiomodulation improves epithelial maturity of radiation-induced oral mucositis wounds

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Abstract

Background. Oral mucositis (OM) is a common injury in cancer patients that can be caused by radiation therapy to the head and neck or certain chemotherapy drugs. The clinical extent of its manifestation is variable, especially when induced by ionizing radiation. In such cases, OM causes ulceration, severe pain when accompanied, risk of local and systemic infections, and increased treatment costs. There is no therapeutic consensus for the treatment of OM in recent decades.

Objectives. The focus was placed on photobiomodulation (PBM) using low-intensity lasers at red and infrared wavelengths. This is a non-drug option that can ease discomfort and speed wound healing. The mechanism of action of PBMs in the evolution of OM reduction is not clear.

Materials and methods. With the aim of clarifying the role of PBM in the progression of epithelial maturity in OM ulcerations induced by ionizing radiation, the present study evaluated the effect of PBM with a wavelength of red (λ), 660 nm and infrared, and 780 nm in radio-induced OM lesions, on the tongue of mice, 8 and 20 days after irradiation, in a single year, with 20 Gy, from a source of gamma lightning. The percentage area corresponding to the positive staining for cytokeratin proteins 10 (CK10) and 14 (CK14) was evaluated in the epithelial area of the lesions using the immunohistochemistry (IHC) technique, after 8 and 20 days of lesion challenge and compared to an untreated control group. The CK10 is a protein related to epithelial cells with a higher degree of maturity and differentiation. It can collaborate with the tissue's innate defense response and was significantly more expressed in the group treated with 660-nm PBM.

Discussion. The protein related to epithelial layers of lower cell maturity (CK14) is important for the resistance of the basal area of the epithelium and should be restricted to these cell layers, closer to the connective tissue in healthy epithelia. In this study, it did not show quantitative differences between groups. Its distribution pattern, however, remained altered on the 20th day of the experiment for the control group. In the groups treated with PBM, CK14 was already present with its marking delimited to the basal layer of the epithelium.

Conclusions. According to the analyses obtained in the evaluated samples, the PBM treatment was able to optimize the expression of the epithelial proteins studied here and related to the epithelial maturation process.

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Antimicrobial photodynamic therapy in orofacial harmonization

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Abstract

Background. Laser therapy is a therapeutic treatment involving the incidence of an electromagnetic beam of laser light with a specific wavelength. Orofacial harmonization is a new specialty of dentistry responsible for the esthetic and functional balance of the face, through different techniques and materials.

Objectives. The main objective of the lecture will be to show how laser therapy can help in the prognosis of orofacial harmonization procedures through its local and systemic action.

Materials and methods. The concepts of laser therapy will be shown through the presentation of clinical cases in order to illustrate the applicability of the modified protocol of systemic laser; laser and LED biophotonics combined with the action of dermocosmetics for skin treatment; and antimicrobial photodynamic therapy for the treatment of complications that may occur in orofacial harmonization treatment modalities.

Conclusions. The search for esthetic perfection requires technological innovation, materials and new techniques in pre- and postoperative treatments in orofacial harmonization. In this context, the beneficial effects provided by low-intensity laser therapy on biological tissues are excellently allied with the clinical practice of the specialty.

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Microneedle technique allied to bio-photonic in orofacial harmonization

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Laser diagnostic methods as a support in the diagnosis of oral potentially malignant disorders

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Abstract

Oropharyngeal cancer (OPC) is a lethal condition becoming more common globally year by year. Nearly 5% of all deaths in Poland between years 2008 to 2015 have been due to head and neck cancer. Early detection of oral potentially malignant disorders (OPMD) increases the survival rate of OPC. Diagnostic tools have not been developed since the last century and have not significantly improved survival rates among OPC patients. Current routine diagnostic methods proved to be insufficient and need to be developed. The purpose is to refer the patient towards oncological treatment as quickly as possible. It has been proven that autofluorescence spectroscopy is useful for the detection of OPMD. The aim of this study is a comparative assessment of Lasotronix™ diagnostic diode laser (DL), light-based Microlux™ system (ML) and conventional clinical examination under operatory light (CCE) in the visualization of OMLs, and validation of listed methods' efficacy in predicting OPMD's histopathological examination results. Thirty patients were examined using the mentioned methods by 4 independent researchers. Medical history concerning OPC risk factors was collected. Data were statistically analyzed. The results, the p-value of which was less than 0.05 were considered statistically significant. The Wilcoxon test was used for the comparison of the results. A receiver operating characteristic (ROC) curve has been analyzed, considering the Holm–Bonferroni method, resulting with DL (area under the ROC curve (AUC) = 0.78; p = 0.002), ML (AUC = 0.68; p = 0.150), CCE (AUC = 0.62; p = 0.401). In comparison with histopathological examination, only DL can accurately predict OML. Comparison with similar research led to a conclusion that while DL can replace neither histopathological examination nor oncological surveillance, it is a good adjunct tool in routine general dental practice and can potentially increase the detectability (and consequently curability) of OPMDs. This conclusion can be a step towards breaking decades of stagnation in OPMD diagnostic methods, however, more research needs to be conducted.

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A resection procedure along with a cystectomy using the Er:YAG laser: A case report

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Abstract

Lasers are gaining popularity in dental surgery procedures. They make it possible to reduce the invasiveness of the procedure and, more importantly, provide disinfection of the surgical field. This paper describes the case of a patient who was referred to our office for a right-sided maxillary cystectomy with resection and retrograde root filling of tooth 12. The patient underwent a full radiological diagnosis using cone-beam computed tomography (CBCT) examination and the treatment was planned. The patient underwent a cystectomy with mechanical excavation of the lesion along with disinfection of the surgical field and resection of the root apex of tooth 12 using the Er:YAG laser. This was followed by retrograde root canal preparation using ultrasound and root canal filling using bioactive material. The patient was treated with fractional A-PRF, which was used to fill the cystectomy bone cavity and as a barrier membrane. Currently, the patient is under observation for healing. A follow-up CBCT is scheduled in 6 months. Clinically, there are no signs of inflammation.

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Root apex resection: A case study

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Abstract

Background. Root apex resection is a procedure that consists of cutting off tooth apex and cleaning the surrounding bone from all lesions and inflammations. This sort of treatment is performed in cases in which there is no possibility of endodontic canal retirement.

Objectives. The main goal of apical surgery is to prevent bacterial leakage from the root-canal system into the periodontal tissue.

Materials and methods. A 41-year-old patient was referred to the periodontology office in Jasło due to the fistula on the gum in the area of the lateral incisor on the right side of the jaw. The patient reports that a tooth apex resection was performed a few years ago. Internal examination revealed a fistula in the area of the maxillary lateral incisor. The central and lateral incisors were splinted by prosthetic crowns. The X-ray revealed a metal post. The root canal was not properly filled and the periapical lesion was being observed. Due to this local condition, the decision was taken to conduct the revision by surgical intervention. The procedure of apex resection was performed under local anesthesia with Septanest (articaine hydrochloride 40 mg/mL and adrenaline 0.005 mg/mL – Septodont, Saint Maur des Fosses, France). A full-thickness flap was made to visualize the periapical region of the tooth.
The resection involved removing the infected and inflamed tissue and the tip of the root. Due to the presence of the metal post in the root canal, it was not possible to remove the whole infected tooth apex. In order to perform proper decontamination, antimicrobial photodynamic decontamination (aPDT) was applied. Toluidine blue (PAD SMART SOLUTION UNIVERSAL GEL, Lasotronix, Poland) was applied to the surface of the root and surrounding bone for 3 min. After that time, the excess of solution was collected with a suction tip. Then, the surgical area was irradiated with a 635-nm laser (400 mW, time of activation: 30 s, SmartM Pro, Lasotronix, Poland), using a green color-coded applicator to activate the toluidine blue. In the next step, the surgical wound was rinsed out with the use of 0.9% NaCl. The apex was filled with the MTA cement (MTA +, CERKAMED, Poland) to seal it. The significant postsurgical bone loss was filled with CGF obtained from the patient's venous blood. The wound was then closed using surgical sutures (PTFE Coreflone 5-0, Implacore, Poland). After surgery, a single photobiomodulation session was performed with 635-nm diode laser (SmartM PRO, Lasotronix, Poland) by applying a dose of 8 J/cm^2 (4 J) per point along the cut line, 4 points, applicator width: 8 mm, the total amount of energy dose was 16 J. The sutures were removed 2 weeks after the procedure. Postoperative healing proceeded properly. One year after the procedure, the patient visited the office for a follow-up. The examination confirmed the total healing of the fistula and the appearance of gingival recession. It was decided to conduct the recession covering with a connective tissue graft from the palate. The recession was covered using the tunnel method under local anesthesia. After surgery, a single photobiomodulation session was performed with a 635-nm diode laser (SmartM PRO, Lasotronix, Poland) by applying a dose of 8 J/cm^2 (4 J) per point along the cut line, 4 points, applicator width: 8 mm, the total amount of energy dose was 16 J. The sutures were removed after 14 days. Another follow-up visit was conducted 1 year after surgery. The treatment effect was fully satisfactory both to the patient and the operator. The lesions were fully healed and the mucogingival esthetics improved.

Conclusions. Apical surgery is currently considered a predictable treatment option to save a tooth with apical pathology that cannot be managed by conventional, non-surgical endodontics. The aPDT is a very effective addition to the standard surgical procedure, due to the lack of side effects and the possibility of using it directly on tissues without any side effects. In addition, the use of a biomodulation laser accelerated healing and reduced postoperative discomfort in the patient.

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Vestibuloplasty with 980-nm diode laser: A case study

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Abstract

Background. Maxillary atrophy is one of the problems observed in older patients, which requires performing prosthetic surgery to create good retention and esthetics for dentures by increasing the vestibular depth and also to increase the width of the keratinized gingiva. Several treatment techniques have been described in the literature, such as Kazanjian's technique, Clark's apically positioned flap and free gingiva graft. This case report describes the conventional vestibuloplasty technique performed using the 980-nm diode laser. After the procedure, the 635-nm diode laser was applied for better and uneventful postoperative healing.

Materials and methods. The 57-year-old patient was referred to the prosthetic office in Jasło to make a new prosthesis. The current prosthesis did not hold properly on the mucosa. In the medical history, the patient did not mention any general diseases or allergies. The patient does not take any medications and does not smoke. The medical examination showed a shallow vestibule of the oral cavity in the maxilla, which made it impossible to make a correct prosthesis. It was decided to deepen the vestibule of the oral cavity in the maxilla using a diode laser to enhance the retention of the new denture. The procedure was performed under local anesthesia with Septanest (articaine hydrochloride 40 mg/mL and adrenaline 0.005 mg/mL – Septodont, Saint Maur des Fosses, France). The deepening of the vestibule was performed using a 980-nm laser (SmartM PRO, Lasotronix, Poland) at power of 6 W, t_{on}: 100 µs, t_{off}: 100 µs, frequency: 5 kHz, fiber: 320 µm, average power: 3 W, spot area: 0.0008038 cm^2, average power density: 3732.2717 W/cm^2). The prosthesis used so far has been lined with cold-polymerized acrylic material (Everall7, Poland). Subsequently, the COE-COMFORT – Tissue Conditioner (GC America) was placed on the denture relining after it had been fully polymerized to protect the mucosa against residual monomer. A single photobiomodulation session was performed with the 635-nm diode laser (SmartM PRO, Lasotronix, Poland) by applying a dose of 4 J (8 J/cm^2) per point along the cut line, 10 points, applicator width: 8 mm, the total amount of energy dose was 40 J.

Results. The postoperative wound healing took 4 weeks. Already at the healing stage, the lined prosthesis showed much better retention, thanks to which the quality of patient's life considerably improved. In such cases, the ultimate denture may be performed after approx. 1 month after the laser surgery.

Conclusions. In the case of missing teeth, the use of implants is the treatment of choice. However, there are patients who, for various reasons, cannot take advantage of this treatment option. Then, the presented method seems to be the best for improving the functioning of removable restorations. The use of a 980-nm diode laser may be an alternative method of surgical treatment.

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Photobiomodulation therapy during the orthodontic treatment and periodontium protection: A clinical case report

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Abstract

Background. The discussion on the orthodontic treatment influence on periodontal status is still ongoing. It has been proven that some orthodontic movements, especially those which drive roots out of the bone envelope, promote gum recessions. Since laser photobiomodulation therapy is regarded to have a periodontium protection effect, the authors want to present its use in the case of orthodontic treatment.

Case description. The orthodontic treatment of a 17-year-old patient with severe skeletal jaw discrepancy aimed at dental compensation of skeletal overjet and deep bite accentuated with a dental orthodontic dysplasia. The patient's request was to correct the bite while avoiding orthognathic surgery. Face analysis: brachyfacial, transfrontal, high nasiolabial angle, accentuated supramental sulcus. Bite: Angle class II, division II, tooth 36 loss, deep bite over crown height. Thick gingival biotype. The cephalometric analysis indicated the borderline of orthodontic compensation/orthognathic surgery dispensary groups. The decision was to make an orthodontic compensation by means of aligner therapy. The Invisalign system has been used, augmented with the use of anterior bite planes and intraoral class II traction. The first series of aligners consisted of 36 aligners. The treatment was modified by the use of a rigid upper bite plate "Sveed type" while proclining the lower incisors and the lower splint with protruding labially bite ramps while intruding and retruding upper incisors. This procedure extended the phase to 13 months. Then, the secondary series of 27 aligners has been used with the class II intraoral traction. The aim of this phase of treatment was the excessive proclination of lower incisors, thus photobiomodulation has been used. A 635-nm diode laser has been used, with continuous wave mode, output power – 100 mW, energy per point – 2 J, time of single irradiation – 20 s, fluence – 4 J/cm^2, power density – 0.2 W/cm^2, 12 points of irradiation in contact with gingiva (6 points vestibular, and 6 points lingual). We used a glass, angular laser tip (8-mm diameter, surface area – 0.5 cm^2). Treatments were performed every 3 days and 3 series of 10 treatments each have been conducted. The interval between series was 2 weeks. The treatment is in its last phase, reaching the compensation borders. No detrimental effects on periodontium have been recorded.

Discussion. Although the treatment was not 100% effective, the patient was pleased and the presented bite correction was significant. Moreover, the detrimental effect of lower incisors' proclination has been avoided. It is not possible to determine in the single case presentation if the sound periodontium was the photobiomodulation effect, but the literature supports such statement. Wasting the opportunity of making orthodontic treatment safer by neglecting photobiomodulation is an unforgivable mistake.

Conclusions. Photobiomodulation has become an important treatment modality in the orthodontic specialty.

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The use of magnetolaserostimulation in the treatment of postoperative sensory disorders of the inferior alveolar and lingual nerve

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Abstract

Background. Magnetolaserostimulation is an important part of physical medicine. The combination of the action of electromagnetic waves and laser light finds important applications in the rehabilitation of, among other things, the peripheral nervous system.

Objectives. The purpose of this study was to evaluate the applicability of magnetolaserostimulation in the rehabilitation of sensory disorders of the inferior alveolar and lingual nerve following surgical procedures.

Case description. Sensory disorders of the inferior alveolar nerve can occur after a surgical procedure of removing a retained tooth or extracting a cyst. This is due to anatomy – the position of the tooth versus the course of the nerve or the cause is iatrogenic, while sensory disturbance of the lingual nerve is most often caused by an incorrect surgical incision technique. In qualifying for the procedure, the following exclusion criteria were considered: pregnancy, active bacterial, viral or fungal infection, patients with electronic heart implants that do not have their own screen, people with active gastric and duodenal ulcers, and those diagnosed with cancer. Magnetolaserostimulation was used in 5 patients who had undergone surgical procedures to remove a retained tooth at other facilities. In 4 of them, the problem was an inferior alveolar nerve disorder in the form of primarily hypersensitivity and in one, paresthesia and hypersensitivity of the lingual nerve. The patients presented at different intervals since the procedure was performed. Vitamin B complex was included in each of them by the attending physicians. The study used a Viofor JPS apparatus emitting a slow-variable magnetic field with a laser attachment and used an elliptical applicator whose wave propagation radius was about 6 cm. Patients had treatments 3 times a week. Before each treatment, they were advised to drink a glass of mineral water to improve intercellular fluid transport. A schedule of 15 treatments was adopted unless the patient decided to stop the treatment sooner due to the full return of sensation. The most common subjective sensations in the course of the treatments given by the patients include feelings of warmth, tingling, stinging, and radiating. The fastest full return of sensation occurred after 3 treatments in a patient in whom magnetolaserostimulation was turned on 3 days after treatment.

Results. The magnetolaserostimulation treatments resulted in a complete return of sensation in 4 patients with inferior alveolar nerve disorders. A patient with hypersensitization and paroxysmal paresthesia of the lingual nerve showed a return of sensation of about 40% after the first cycle of treatments.

Conclusions. Magnetolaserostimulation is an important method of rehabilitation of the peripheral nervous system. The timing of the start of the treatments from the onset of sensory disorders has a significant impact on the effect of achieving a degree of resolution. The above method of eliminating sensory disorders is an important alternative to pharmacological methods that give lesser results.

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Pain perception following periodontal decontamination treatment with laser therapies: Comparison between oxygen high level laser therapy (OHLLT) and laser-assisted new attachment procedure (LANAP)

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Abstract

Background. In periodontology, lasers have been suggested for the nonsurgical treatment of chronic periodontitis. Many wavelengths were tested, but unfortunately, most of them were not efficient. An Nd:YAG laser was applied in a specific protocol named the laser-assisted new attachment procedure (LANAP). The Nd:YAG laser, interacting with endogenous chromophores provokes the vaporization of the granulation tissue in a selective way, associated with reduced bleeding. Photodynamic therapy without Dye, also called oxygen high level laser therapy (OHLLT), was also investigated. The OHLLT combines high-power diode laser with hydrogen peroxide solutions to release singlet oxygen in the periodontal pockets. Singlet oxygen can break down the bacterial membranes of microorganisms belonging to the red and orange Socransky complex, the main culprits of periodontal disease. Both techniques seem to favor the regeneration of tooth support tissues and find comforting evidence in the literature. A study already published by the authors compared the effects of the LANAP and OHLLT techniques with the traditional scaling and root planing procedure, demonstrating the greater effectiveness of laser techniques, similar to each other, compared to the traditional technique.

Objectives. The aim of this study, parallel to the one previously described, is to compare the perception of post-operative pain in patients treated with the LANAP technique and in those treated with the OHLLT protocol.

Materials and methods. Twenty patients aged between 18 and 65 years and with a diagnosis of at least 3rd degree periodontitis were recruited. They were randomly divided into 2 groups of 10 subjects each: patients treated following the LANAP protocol (Group 1); patients treated according to the OHLLT protocol (Group 2). Patients referred to the pain they felt after the first session of non-surgical periodontal therapy using a numerical rating scale (NRS), ranging from 0 to 10, with specific intervals of time: 0 h (T_0), 6 h (T_1), 12 h (T_2), 24 h (T_3), 48 h (T_4), and 7 days (T_5). The Wilcoxon–Mann–Whitney test was used to evaluate differences in NRS reported values between the 2 groups. Furthermore, a microbiological test of the periodontal bacterial load was performed in all patients with real-time PCR tests before treatment (T_0) and after 7 days (T_5).

Results. The qualitative pain scores revealed statistically significant lower pain levels in the OHLLT group compared with the LANAP group at all time intervals ($p < 0.05$), except for the preoperative values, where significant differences have not been observed. The pain also decreased faster in Group 2, with a score test near to 0 after 24 h. The amount of periodontal bacteria 7 days after treatment was statistically equal in both groups, and statistically lower than pre-treatment.

Conclusions. Both the OHLLT and LANAP protocols are efficient in the nonsurgical treatment of periodontal disease. It is necessary to consider, however, that the OHLLT protocol does not expose the patient to any thermal risk, which is present with the LANAP method. In fact, the post-operative pain perceived after the OHLLT protocol is lower. The OHLLT is in fact a less invasive and less operator-dependent technique than LANAP.

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Transmission of 2780-nm wavelength within polycrystalline and monocrystalline sapphire orthodontic brackets

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Abstract

Background. The studies confirmed the preference of using erbium lasers in ceramic bracket debonding. The most important factor in the mechanism of ceramic bracket debonding is erbium laser transmission through the ceramic brackets to reach the adhesive resin.

Objectives. To identify the transmission of 2780-nm wavelengths through different types of ceramic brackets.

Materials and methods. A total of 40 ceramic brackets were equally distributed to 4 groups (10 monocrystallinesapphire brackets – Radiance, American Orthodontics, Sheboygan, Wisconsin, USA; 10 monocrystalline sapphire brackets – Absolute, Star Dentech, Seoul, Korea; 10 polycrystalline brackets – 20/40, American Orthodontics; 10 polycrystalline brackets – 3M Unitek Gemini Clear Ceramic, Monrovia, California.
The ceramic bracket was mounted on the spectrophotometer (FTIR IRPrestige-21; SHIMADZU, Tokyo, Japan) as followed in the lab for other similar samples. The transmission ratio was obtained through IRsolution software for the 2780-nm wavelength. The mean transmission values were compared between the 4 test groups, using one-way analysis of variance (ANOVA) tests followed by Bonferroni (post-hoc test).

Results. The highest transmission ratio was determined for Radiance monocrystalline sapphire brackets (64.10 %), and the lowest was determined for 3M polycrystalline brackets (40.65%). The differences among the different ceramic brackets were significant ($p < 0.05$).

Conclusions. Monocrystalline sapphire brackets have the highest transmissibility for 2780-nm wavelengths, and that makes the possibility of debonding them by using the Er,Cr:YSGG laser through thermal ablation mechanism higher.

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A case report of non-trauma-related coccygodynia treated with laser photobiomodulation and other non-surgical methods

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Abstract

Background. Coccygodynia is a painful syndrome affecting the coccyx (tailbone). The problem concerns about 1% of people who suffer from spine pain. The goal of this case report is to raise physicians' awareness about coccygodynia and consider modern treatment options including photobiomodulation.

Case description. Three months after the onset of the tailbone pain, a 21-year-old man presented to a general practitioner. He reported pain around the coccygeal region as well as between the anus and the sacral bone. The pain increased while sitting, standing up, coughing, laughing, or passing stools. The patient denied any acute or chronic trauma to the region. The patient had a history of well-controlled diabetes mellitus type I for about 10 years (hemoglobin A1c (HbA1c): 6.7%). Physical examination revealed pain on palpation around the coccyx bone radiating towards the anus. The anus itself was without pain on palpation, and per rectum digital examination revealed no pathology. In diagnostics, several imaging techniques were applied: X-ray, computed tomography (CT) and magnetic resonance imaging (MRI) of the region, showing angular position of the coccyx, sigmoid scoliosis and steep position of the sacral bone. Bone fractures, soft tissue pathology and malignancy were excluded. In the initial treatment, first-step analgesics such as acetaminophen, ketonal were applied however not providing satisfying relief. Second-line treatment using a combination of acetaminophen and tramadol reduced the pain allowing for everyday activities.
Next, local laser therapy of the coccygeal region combined with full body laser bed irradiation was performed for 3 consecutive days. It consisted of applying the laser light locally at 1064-nm wavelength, neodymium laser with handpiece Marco L (100 micros; 0,50 W/cm^2, 10 Hz, 159 J) in 3 different points above the coccyx, along with full body irradiation at laser bed (LED bed, Thor Photomedicine Ltd., UK) with wavelengths of 810 and 660 nm working at the same time. The time of whole-body irradiation exposure was 3 min (dose: 7.65 J/cm^2) on the first and second day and 5 min (dose: 12.8 J/cm^2) on the third day.
Applied photobiomodulation of the coccygeal region significantly lowered the pain after the first local irradiation session. Patient reported that pharmacological analgesia was no longer required after the significant improvement in pain relief after the third session. Three days after the last session the pain recurred, but it was significantly smaller without the need for oral analgesics. On the follow-up orthopedic consultation, anesthetic injection of steroid and lidocaine under USG control was performed. The procedure relieved pain for about 7 days. The patient was referred to the physical therapist.

Discussion. The case report illustrates the role of photobiomodulation as an alternative approach in coccygodynia treatment. Traditional approach includes oral analgesics, local steroid injections, physical therapy, and exercise, and sometimes lifestyle changes in sitting habits. Many times, in the traditional treatments the reduction of pain is slow, requiring many repetitive sessions of therapy and recurrences, requiring constant pharmacological pain control.

Conclusions. Local and full body photobiomodulation seems to be a viable option of treatment of coccygodynia providing quick symptom relief and little to none adverse events.

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Efficacy of laser-assisted irrigation in decontamination and disinfection of complex root canal anatomy: A clinical case report

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Abstract

Background. The goal of endodontic treatment is to clean and disinfect the root canal system and seal it to prevent infection recurrence.

Objectives. To highlight the benefits of laser-assisted irrigation (LAI) in contemporary, non-invasive endodontics.

Cases description. Patient 1: a 36-year-old men, main complaint: intermittent pain in the apical area of the lower first molar. Patient 2: 46-year-old woman, main complaint: lower second premolar tenderness. Both cases required primary endodontic treatments with diagnosis: necrotic pulp, chronic periapical inflammation. A combination of hand and rotary files was used in conjunction with active irrigation, utilizing photoacoustic effect of erbium laser activation. Initial cleansing of the endodontic space performed with the Er,Cr:YSGG laser 2780 nm (Biolase, Waterlase MD, USA), tip MZ6 9 mm, 600-µm diameter, 10 Hz, 0.5 W, 30-s activation, NaOCl 5.25% used; fluence: 17.70 J/cm^2. Root canal patency and working length (WL) were established with C-Pilot 10 (VDW, Germany), followed by rotary files shaping sequence: glide path 14/04 (Poldent, Endostar EP Easy Path, Poland), with subsequent files 30/08 (18 mm), 25/06, 30/04 (25 mm) (Poldent, Endostar E3 Azure Basic, Poland) to WL-1 mm. Endodontic micromotor with apex locator used (Endo Radar Plus, Woodpecker, China). Active irrigation between each file used: RFT3 17 mm Radial Firing Tip, 300-µm diameter, NaOCl 5.25%, 10 Hz, 0.5 W, 30 s; fluence: 70.77 J/cm^2. Final active irrigation of the complex root canal space was performed with LAI RFT3 17 mm Radial Firing Tip, 300-µm diameter, sequence: NaOCl 5.25% (3 times)/EDTA 17% (1 time)/NaOCl 5.25% (1 time)/distilled water (1 time), 10 Hz, 0.5 W, 30 s each; fluence: 70.77 J/cm^2. Endodontic obturation was achieved with single cone hydraulic compaction technique using calibrated Gutta Percha (WL-1 mm) and Calcium Silicate Based Sealer (CSBS) – TotalFill BC HiFlow (FKG, Switzerland).
LAI allowed reduction in canal shaping and homogenous endodontic obturation of complex apical third anatomy, as well as lateral and accessory canals. The follow up radiographs showed the radiolucencies have resolved, teeth were asymptomatic, indicating bone healing.

Discussion. Mechanical and chemical cleansing play an important role in endodontic treatment. However, mechanical cleansing leaves 35% or more of the root canal system untouched. In addition, it leaves smear layer which can affect the antimicrobial action of root canal sealers. Hence, it is important to remove the layer during RCT. Laser-assisted irrigation seems to be the most efficient smear layer removal method, regardless of the solution used, and helps to overcome limits of conventional activation in narrow root canals and complex apical third anatomy showing great antibacterial and bacteriostatic effects in root canals with a small taper.

Conclusions. Technological advances, such as laser use alongside CSBS, give hope for further increase of success and survival rate of endodontically treated teeth, which may lead may lead to the development of new techniques and reduction of mechanical preparation with the shift to non-prep endodontic treatment in the future.

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Low-level laser therapy for lip lesions healing caused by COVID-19: A case report

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Abstract

Background. The most common clinical manifestations of coronavirus disease 2019 (COVID-19) are dyspnea, fever, dry cough, as well as ageusia and anosmia. Severe respiratory symptoms can be observed, leading to acute respiratory failure, multiple organ failure and even death. The treatment is symptomatic. Oxygen therapy represents the first step to address respiratory compromise that may evolve to noninvasive mechanical ventilation (NIV), and in cases of refractory respiratory failure to oxygen therapy, invasive mechanical ventilation (IMV) may be required. In order to improve gas change, the patient is positioned in prone position, lying face down to relieve the pressure exerted on the lungs area. Therefore, several oral signs and symptoms related to COVID-19 were found, such as nonspecific oral ulcerations, desquamative gingivitis, petechiae, cyanosis, and lip pressure lesions. Since the clinical characteristics of the oral lesions observed in COVID-19 are highly heterogeneous, there are a variety of treatments reported in the literature, ranging from mouthwashes to topical or systemic medications such as antifungals, antibiotics, antivirals, and steroids, in addition to photobiomodulation with laser therapy.

Objectives. The aim of this paper is to report a clinical case, treated non-invasively by low-level laser therapy (LLLT) to minimize the COVID-19 symptoms in the mouth and improve patient's quality of life.

Case report. We present a case of a 55-year-old male patient with leukoderma, hypertensive, diabetic, obese and with psoriasis. The patient presented with secretive cough, dyspnea and 2 pleuritic pains. Admitted in July, 2020, with tachypnea, fever, tachycardia, and desaturation. The patient showed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) viral pneumonia, reversed pulmonary septic shock, ischemic stroke, acute respiratory failure (ARF), prolonged mechanical ventilation, tracheostomy, Shelley catheter recurrent thrombosis (5 exchanges), toxic-metabolic encephalopathy, right lower limb deep venous thrombosis (DVT), and gluteal/sacral decubitus ulcer bedsore with necrosis. Orotracheal, Tracheostomy. The patient was assisted and followed-up by the Hospital Dentistry Service for maintenance of oral hygiene, lubrication of the lesions with mineral oil and laser therapy twice a week. Nevertheless, only after changing the tube for tracheostomy, it was possible to achieve total regression of the lesions.

Materials and methods. Five sessions were performed with red Laser Therapy Ilib® (DMC, São Carlos, Brazil) equipment, 660-nm, 100 mW power, 1 J energy, applied on the lip and tongue lesions for 10 s per point, with a 35.7 J/cm^2 radiant exposure.

Conclusions. The treatment of oral manifestations of the disease with phototherapy seems to be a promising, secure and effective method. Photobiomodulation therapy resulted in a significant clinical improvement of the orofacial condition with 5 sessions, restoring chewing function and food intake with analgesia. Therefore, even with the clear limitations of a case report, this article can add valuable evidence for less invasive treatments without side effects. Photobiomodulation therapy can be used as an adjuvant therapy for this condition, improving patients' quality of life.

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A comparative study on the effect of peri-implant infection management lasers (1064-nm Q-Switch Nd:YAG, 1064-nm Nd:YAG and 980-nm diode) on titanium grade 4 surface

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Abstract

Over the past 10 years, the number of dental implants has significantly grown. This increase has led to an elevation of the statistics related to cases of peri-implantitis. Laser therapy has conquered a place among the therapies of excellence to treat peri-implantitis. However, the laser device used could influence the therapy's success. The aim of this comparative experimental work was to highlight the differences in the work on grade 4 titanium surfaces of the most commonly used laser lights in this field, taking into consideration any structural damage that lasers could cause to implant surfaces. The lasers examined were a 980-nm diode laser; a 1064-nm Nd:YAG laser; and a new generation of 1064-nm Nd:YAG Q-switch nano pulsed laser. We evaluated the titanium temperature increase, the pre- and post-treatment two-dimensional surface appearance observed under the scanning electron microscope; finally, the three-dimensional pre- and post-treatment topographic analysis was performed using atomic force microscopy. We showed that the 1064-nm Q-switch Nd:YAG nanosecond pulsed laser appears to be more suitable for the preservation of implant morphology because of the absence of the induction of metal damage.

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Neodymium: yttrium–aluminum–garnet (Nd:YAG) laser irradiation for root canal and periodontal pocket disinfection: A clinical case report

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Abstract

Objectives. To define the role of neodymium: yttrium–aluminum–garnet (Nd:YAG) laser irradiation in root canal disinfection.

Case description. A 61-year-old patient reported pain in a distal region of the lower first molar (46, FDI classification). The intraoral examination showed grade 2 mobility and (++) percussion. Electric pulp testing was done to check for tooth vitality, which confirmed that the tooth was nonvital. A radiograph showed a widening of periodontal ligament space in relation to the distal root and radiolucency in the distal apical area as well as the presence of dental calculus. Treatment planning was done, considering that the tooth was also nonvital with a periodontal treatment involvement. Phase 1 – emergency phase – root canal treatment. After anesthesia with Articaine 1:100,000 (Merz Denatl, Germany), a rubber dam was placed, and an access cavity was prepared. By initial placing of a No. 15 K file (HS-Maxima®, Germany), a working length was measured using Electronic Apex Locator and radiograph. Then, biomechanical preparation was carried out with 5.25% NaOCl, and 17% EDTA as an irrigants. Master apical files No. 30 in the mesial canals and No. 40 in the distal canal were selected, and after cleaning and shaping, drying was carried out with a paper point (Henry Schein, Germany). The canals were disinfected using the Nd:YAG laser with 200-µm fiber, VSP mode, 1.5 W, 15 Hz, by 10 s/3 times. The fiber was moved from the apex in a coronal direction by tilting and rotation motion. Then, obturation was carried out using the lateral condensation technique with gutta-percha (Dentsply Sirona, Germany) and a sealer (CeraSeal, Germany).
Phase 2 – oral prophylaxis. After professional teeth cleaning, periodontal treatment scaling and root planning was carried out. After 1 week, the pocket was disinfected with CHX gel placed into the pocket and the Nd:YAG laser (300-µm fiber, 2 W, 20 Hz, 2×30 s). The same procedure was repeated after 1 and 2 weeks. Phase 3 – recall and review. The patient was controlled after 3, 6 and 12 months. The periodontal examination and the RTG confirmed proper healing and reduction of the periapical lesion.
Conclusions. Laser light can penetrate canal areas where irrigation and disinfecting solutions cannot reach, such as fins, deltas and lateral canals. Selective photothermolysis occurs when laser energy is applied to the root canal system. The Nd:YAG laser photothermal disinfection can be achieved for microbial deposits deep within dentin which would not be reached by most medicaments placed into the canal.

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Frenulotomy: Not only the technique matters

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Abstract

Background. In recent years, there has been an exponential increase in the incidence of tongue frenulotomy in neonates and infants. However, like any surgical procedure, it is fraught with the risk of potential complications. Qualification for surgery should be made at all times on the basis of comparing potential benefits with possible risks. In order to do this properly, it is imperative that this decision is based on scientific evidence that justifies the need, the timing and the manner in which it should be carried out. Various potential complications are cited as reasons for performing a frenulotomy, and these include: obstructive sleep apnea (OSA), feeding difficulties, impact on malocclusion formation. However, an important question is: which of these have been scientifically linked to the short frenulum of the tongue?

Objectives. The aim of this paper was to: 1. determine whether a short frenulum of the tongue impairs eating and pronunciation, and whether it impairs the craniofacial development; 2. determine the age of the patient at which a reliable diagnosis of the length of the frenulum of the tongue can be made and, after the procedure of its lengthening, the greatest clinical benefits can be achieved.

Materials and methods. We qualified original studies, narrative articles and systematic reviews for the analysis concerning the subject of short frenulum of the tongue in generally healthy people of all ages.

Results. On the basis of the collected articles, we proved that: 1. the diagnostics of the length of the frenulum of the tongue is not systematized and there are no clear recommendations as to the type of surgery; 2. complications related to the tongue frenulotomy are the more serious for the general health condition the younger the patient is; 3. a short frenulum of the tongue is related neither to the quality of food intake in the neonatal and infantile period nor to the development of the patient's normal pronunciation; 4. a short frenulum of the tongue results in morphological changes in the lower craniofacial region and the neck, such as: a) narrowing of the maxilla manifested by a reduced intercanine and intermoral dimension and an increased palatal height, b) a change in the position of the hyoid bone, which may be related to the development of OSA, c) an increase in the SNB angle and d) an increase in the lower facial height; 5. the relationship of the length of the frenulum of the tongue to its position and to malocclusions is unclear, so a short frenulum cannot be considered an etiological factor for the class II malocclusion; it can only be thought to contribute to the frequent opening of the mouth in infants, resulting in an open bite.

Conclusions. The obtained results allow us to conclude that, in the absence of a risk of OSA, the timing of tongue frenulotomy should be determined by the point at which the formation of the maxillary and/or mandibular skeleton allows the risk of skeletal class III and primary crowding to be recognized. Theoretically, this sets the lower age limit of indication for frenulotomy at approx. 4 years, which, due to the individual nature of the disorder, does not relieve from the obligation of an orthodontic consultation in every case of short frenulum of the tongue. The aspect of the patient's respiratory disorders, which may be an absolute indication for tongue frenulotomy regardless of the patient's age, still requires research into the relationship between the length of the tongue frenulum with its position and its influence on the width of the skeletal bases and the position of the hyoid bone.

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Clinical effectiveness of laser-assisted immediate implant placement socket shield technique: A case report

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Abstract

Background. The treatment of vertical root fracture (VRF) may be difficult due to the bone resorption. It is important to place the implant immediately due to the reduction of alveolar dimension during the wound healing because of the possibility of the implant placement decreases over time. Socket shield technique (SST) has been described as an alternative method to maintain the alveolar ridge when placing immediate implants in the esthetic zone.

Objectives. The use of the laser is to support the healing process and reduce the patient's postoperative ailments as well as reduce the risk of periodontal ligament damage. The presentation shows the results of the treatment of immediate implant placement with SST using high power lasers (Er:YAG, Nd:YAG) and photobiomodulation (PBM, 650-nm) in VRF treatment of a 51-years old patient.

Materials and methods. The patient's treatment was started after root fracture. During the first appointment, basic blood examination and CBCT (MyRay Hyperion X5, Italy) scan were performed. While examining CBCT, a thin buccal cortical plate was observed, which could get fractured during extraction. In addition, the TSH index was too high (38 mIU/L). After second blood test after 3 months, the patient was ready for surgery. During this time, the mobile part of the crown was stabilized with a composite. The laser SST was applied to protect the buccal bone and obtain the appropriate esthetic gum. First laser 2940 nm LightWalker AT-S (Fotona, Ljubljana, Slovenia) was used to separate buccal shield (QSP, 250 mJ, 20 Hz, water: 37.2 mL/min, H14 Handpiece (HP), cylindrical TIP diameter 1 mm). After atraumatic root extraction, bone ablation was performed (QSP, 200 mJ; 10 Hz; water: 37.2 mL/min, HP H14, cylindrical TIP diameter 1 mm). Next laser step was disinfection of the free part of alveolar with Nd:YAG (Fotona 300-µm fiber, Short Pulse (SP, 100 µs) 2 W, 20 Hz, non-contact at 2-mm distance, non-active fiber). After laser preparation of alveolus, standard implant placement was started. Thommen Medical Implant diameters of 5.0 mm and 11 mm length, with 30 N cm (primary stabilization) were placed. Photobiomodulation was performed every 2 days for a week. Laser PBM was performed using 650-nm (Pioon Laser, Wuhan, China) dose 8 J/cm^2 buccal and palatal, power: 200 mW, continuous mode, application time: 20 s, applicator size: 8 mm. Three months after the surgery, the implant was loaded with an individual abutment and zirconium crown.

Results. The use of laser reduced vibration that could damage periodontal ligaments attached to the shield and increased patient's comfort. The patient did not report post-operative pain, bleeding or swelling.

Conclusions. Laser-assisted immediate implant placement with SST could be a good alternative in obtaining pink esthetic. Bone ablation with Er:YAG has shown positive effects on bone healing.

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Case report of two patients with vascular malformations of vermilion removed using the diode laser

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Abstract

Background. Hemangiomas are common mesenchymal, benign abnormalities of an orofacial area which may occur at any age. The lesions usually present as purple smooth or lobulated tumors which undergo ischemia under compression. This type of vascular tumors is often present on lips, tongue and oral cavity mucosa. Treatment options include conventional surgery, removal with laser, embolization, or injection of corticosteroids or sclerosing agents.

Objectives. The aim of this poster is to show results of the treatment of hemangioma with diode laser.

Case description. The poster shows a case report of 2 patients who presented to the Department of Periodontal and Oral Mucosa Diseases with vascular lesions in the maxillofacial region – both on the lips. The first patient was a 73-year-old men with a hemangioma on the vermilion of the upper lip, and the second was a 27-year-old woman with a vascular lesion on the margin of the skin and a vermilion. The hemangiomas in both patients were removed with a diode laser using a transmucosal thermocoagulation technique using a continuous exposure mode with 4 W of power and at 980-nm wavelength, keeping a 2–3 mm distance from the lesion.

Discussion. The coagulation of the hemangiomas with laser becomes a gold standard in the treatment of vascular lesions due to the many advantages over other methods of treatment. This procedure reduces operating time and is much safer due to a significantly lower risk of bleeding, which is especially important among patients with cardiovascular diseases. This method is useful among patients with comorbidities who require antibiotic prophylaxis before conventional surgical treatment.

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Case report of fibroma removal from right cheek mucosa with a diode laser

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Abstract

Background. Traumatic fibroma is a benign pathological lesion which occurs as a result of constant irritation of the area. The fibroma presents as round or oval, smooth, pink, pedunculated tumor, usually painless. The procedure of removal of the lesion can be conducted in many ways – conventionally using scalpel excision, with cryotherapy, laser or electrical surgical removal.

Objectives. The aim of this poster is to present a method of treatment with a diode laser.

Case description. A 68-year-old female patient presented to the Department of Periodontal and Oral Mucosa Diseases to consult a lesion on her right cheek. The lesion was of a regular shape, smooth surface, elastic consistency, a wide stalk, and a diameter of about 1.2×1.2 cm – located on an uninflamed mucosa. In the interview, the patient mentioned repeated injuries of the area in a distant, unspecified time. The above suggested a benign change, probably a fibroma. After anesthesia with articaine with adrenaline 1:200, the lesion was resected in 1 piece using a diode laser with a power of 10 W and a continuous wavelength of 980 nm. The bleeding did not occur during the procedure, and the entire excised lesion was examined histopathologically. The patient applied Elugel gel on the wound for a week. At the follow-up visit, the wound showed excellent healing. Subjectively, the patient did not report any negative postoperative symptoms in the following days.

Conclusions. Removal of benign lesions with a diode laser is an alternative to surgical removal, characterized by less intraoperative bleeding, reduced time of surgery and ability to avoid suture that causes discomfort to some patients.

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Treatment of odontogenic inflammatory cyst with Er:YAG ST-Pro laser in endodontic treatment: A case report

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Abstract

Objectives. Evaluation of the possibility of using the Er:YAG Fotona LightWalker ST-Pro laser in the endodontic preparation of teeth for surgical cyst removal.

Case description. Two years ago (2020), in a 23-year-old patient, during a follow-up orthopantomographic (OPG) examination, a lesion was detected in the mandibular body on the right side in the area of teeth 45–48. Cone beam computed tomography (CBCT) examination confirmed a limited bone defect of 39×13 mm, with a gas space of 8×5 mm and loss of the outer cortical layer of bone on the alveolar side. Histopathological examination of the harvested fragment showed a compact bone without atypia. The patient was scheduled for surgical removal of the cyst. As a first step, decompression of the cyst was performed on the buccal side and an obturator was placed. In preparation (September 2022) for surgery, teeth 47 and 48 were qualified for extraction, and 45, 46 for endodontic treatment. During endodontic treatment, obliteration of the proximal MB and ML canals was diagnosed in the mesial root of tooth 46, impossible to work with previous methods (ultrasound, rotary instruments). The Er:YAG Fotona LightWalker ST-Pro laser in SWI MM mode, 80 mJ, 20 Hz, tip conical, was used to treat the canal system. In the treated canals, a final rinsing module of each canal was carried out with the laser for 30 s with 10 mL, 40% citric acid, 5.25% NaOCl, 0.9% NaCl; previously, half of the concentration of the abovementioned solutions had been used to prepare the canals. The canal of tooth 45 and the distal canal in tooth 46 were filled in the apical part to more than ½ of the canal lumen length with the WellRoot PT bioceramic material (Vericom, Korea). The remaining part was filled after hardening of the material by lateral condensation of gutta-percha with AHplus sealer. The access to the cavities of the treated teeth was sealed with a composite restoration. Three months after completion of the treatment, a reduction in the size of the cysts in the apex region of teeth 45 and 46 was noted on the OPG radiograph and the decision was taken to endodontically treat tooth 47. In tooth 47, a gingival cavity on the distal wall became visible from the chamber side owing to the laser application. In tooth 47, the full-length canals were filled with WellRoot PT and sealed with a composite restoration.

Discussion. Most inflammatory periapical lesions in bones are granulomas and cysts. Scientific research has repeatedly demonstrated a lack of correlation between clinical, radiological and histopathological diagnosis. The accuracy of the diagnosis of the abovementioned conditions is rated differently by different authors. In surgical treatment of the cysts, a full enucleation is desired, on the other hand, effective endodontic treatment contributes to regeneration of large periapical lesions, reducing the scope of surgical intervention.

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Endodontic treatment with Er:YAG and Nd:YAG laser: A case report

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Abstract

Lasers are finding more and more applications in the daily practice of the dentist, especially in the field of endodontic treatment. Many times, lasers support endodontic-surgical treatment. The present study describes the case of a patient who presented for endodontic treatment of teeth 21 and 22 with an active fistula in casts 21 and 22 prior to a scheduled maxillary cystectomy. The patient underwent a complete radiological diagnosis with cone beam computed tomography (CBCT) slice examination assessing the extent of the lesion and creating a treatment plan. The patient underwent single-visit endodontic treatment of teeth 21 and 22 in a classic endodontic protocol using SWEEPS technology in a Fotona LightWalker AT-S Er:YAG laser. In addition, deep root canal disinfection was conducted using the Nd:YAG laser. According to the treatment plan, the decision was made to postpone the cystectomy procedure and decide on further management after a 6-month follow-up and a follow-up CBCT. Follow-up radiological diagnostics using CBCT examination was performed after 6, 18 and 30 months. The patient's clinical examination 6 months after the procedure showed no clinical signs of inflammation. Control CBCT examinations showed almost complete healing of the bone tissue in the treated area.

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Effect of different Er,Cr:YSGG laser tips on the root surface in adjunct to mechanical therapy: A descriptive in vitro scanning electron microscopy study

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Abstract

Background. The principal objective of periodontitis treatment is the removal of all bacterial and calcified deposits. Effective mechanical instrumentation of the root surface is an important aspect; however, mechanical debridement is technically demanding and can create a smear layer. The adjunctive use of lasers has been reported to exhibit bactericidal and detoxification effects. The Er,Cr:YSGG laser (wavelength: 2780 nm) has a high degree of absorption by water, thus acting on mineralized surfaces by means of water vaporization. As this laser is capable of ablation in both soft and hard tissues, it can be used for periodontal hard tissue treatment such as root surface debridement.

Materials and methods. Thirty periodontally involved single-rooted extracted human teeth were selected with the presence of calculus. A square-shaped area of 5×5 mm and identification in scanning electron microscopy were marked for subsequent treatment. Thirty samples were divided into 6 groups. Group 1 received no treatment. Group 2 received scaling and root planing (SRP) with curettes and ultrasonics. Groups 3–6 received Er,Cr:YSGG irradiation in adjunct to SRP with the help of Cylindrical (MZ6 14 mm), Chisel (MC3 9 mm) and Radial Firing Perio tip (RFPT5 14 mm), respectively. Irradiation was performed in short pulse mode (60-µs H mode) with output power of 1.5 W, 50% water, 40% air, and 30 Hz, 50 mJ/pulse in a non-contact mode for 60 s.

Results. All samples in laser + SRP groups (groups 3–6) demonstrated rough surface with no remaining calculus and smear layer in comparison to group 2. Group 2 with manual instrumentation showed incomplete removal of calculus and the presence of smooth surface, smear layer and occluded dentinal tubules, whereas laser-irradiated groups showed open dentinal tubules. In group 2, a statistically significant difference was observed in terms of rough surface, remaining calculus, absence of smear layer, and presence of open dentinal tubules, when compared to laser-irradiated groups. There was no statistically significant difference observed between SRP and laser-irradiated groups in terms of loss of tooth substance and presence of craters. None of the treatment groups showed signs of thermal damage such as dentinal melting.

Conclusions. Different Er,Cr:YSGG laser tips in adjunct to conventional therapy are more effective in promoting rough root surfaces with the absence of calculus, smear layer and dentinal melting in comparison to conventional therapy alone. Within the limits of the present study, laser irradiation with the RFPT5 tip in adjunct to conventional therapy offers maximum, and MZ6 offers minimum benefit in periodontal root surface debridement.

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Easy chairside management of venous malformation of the lip with esthetic results using a 940-nm diode laser: A case report

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Abstract

Objectives. This report aims to explain the ease of managing small vascular lesions of esthetic concern in a dental setting.

Case description. A 60-year-old female, non-smoker, not taking medication, and generally healthy was referred to our office with a main complaint of unesthetic lesion of the lower lip that occurred after trauma and recurrently bleeds with slight trauma. Physical examination revealed a 10 mm in diameter vascular lesion on the lower lip. It was decided to remove the lesion using a non-contact technique employing a diode laser with a wavelength of 940 nm. Topical anesthetic gel (benzocaine 20%) with no local infiltration anesthesia was applied. The procedure was performed using a 940-nm diode laser (EpicX, Biolase, USA) in continuous wave mode with a 300-µm non-activated tip. During irradiation, fast-paced circular motions were made around the lesion (tip was in a constant motion), moving from the inside of the lesion inward at a distance of 2 mm from the lesion surface. The following settings were used: power: 2.5 W, the 30 s × 3 repetitions with 30-s intervals. During interval, a cotton swab submerged in ethylchloride spray was dabbed on the lesion to cool the area down. The lesion was irradiated until all parts had coagulated and turned white. The patient had experienced minimal, although bearable pain.
The follow-up was conducted 3 weeks post-irradiation. The postoperative period was uneventful, and no analgesics were required. No complications occurred. The 3-week follow-up revealed complete elimination of the lesion with no scar tissue formation.

Discussion. Other than obvious esthetic concerns, venous malformations can cause discomfort to patients by impeding proper function (speaking, biting, etc.) and occasional bleeding.

Conclusions. Management of small vascular malformations in a dental setting using a diode laser and transmucosal thermo-photocoagulation is an effective method that provides esthetic results.

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Photoactive disinfection and photobiomodulation using a 635-nm laser in endodontic treatment: A case report

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Abstract

Objectives. This study aimed to evaluate the use of photoactive disinfection (PAD) and photobiomodulation (PBM) in the endodontic treatment of the maxillary second premolar tooth.

Case description. A 25-year-old man presented for primary endodontic treatment of a second premolar tooth in the maxilla (15 FDI classification). Infiltration anesthesia using Citocartin 1:100, 1.8 mL (Molteni, Italy) was administered, and rubber-dam (Cerkamed, Poland) was placed. Endodontic tooth preparation was carried out with the use of hand instruments C-Pilot #10 (VDW, Germany). The endometer (Shlumbohm EndoPilot, Germany) was utilized to measure the working length (WL) of the treated canal. Root canal shaping with glide path was made with proglider (Dentsply/Maillefer, Switzerland). In the next stage, the canal was prepared mechanically with Primary WaveOneGold #25/07 (Dentsply/Maillefer). A contra-angle handpiece with an endomotor (Shlumbohm EndoPilot, Germany) was used to drive the rotary instruments during root canal preparation. Preparation of the WL – 1-mm canal was carried out. A flushing protocol employed NaOCl 5.25%, EDTA 17% and NaOCl 5.25% with the following sequence: injection of NaOCl in the root canal with a hand syringe equipped with an endodontic needle; NaOCl activation using an ultrasound instrument (EMS, Switzerland) with Irrisafe tip (Satelec, England) with a sequence of 3x20 s. After activation, the fluid was removed from the root canal with a suction device. Next, the following flushing sequence was performed: 10 min of slow flushing with 5.25% NaOCl (WL – 2 mm); 30 s of slow flushing with 17% EDTA (WL – 2 mm); 15 s of slow flushing with 5.25% NaOCl (WL – 2 mm). The fluids were removed from the root canal with a suction device.

The PAD was performed by introducing toluidine blue photosensitizer (PS) into the canal for 60 s, the excess was removed with a suction device, and the 635-nm diode laser (Lasortonix, Poland) was used for PS activation with the following parameters: power 400 mW, time 30 s. The canal was rinsed after laser exposure with sterile distilled water and filled with 3D system B+Obtura using Adseal sealer (Meta Biomed, South Korea). Photobiomodulation of the root apex area on the buccal side was performed immediately and 24 h after endodontic treatment with a 635-nm diode laser (Lasotronix, Poland) using the following parameters: power: 100 mW, CW mode, dose: 3 J/cm^2, exposure time: 15 s, applicator diameter: 8 mm, spot area: 0.5 cm^2. The pain level measured on the same day of the treatment and 24 h after on a visual analog scale (VAS) was 0.

Conclusions. The PBM and PAD increase post-treatment comfort for the patient (reduced pain) and improve canal decontamination's effectiveness in endodontic treatment, respectively.

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Laser and ozone effect in postoperative oral surgery pain management: A randomized clinical study

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Abstract

Background. Until now, there are no studies in the literature evaluating the efficacy of the combination of low-level laser therapy (LLLT) and ozone therapy in the management of post-surgical pain.

Objectives. The aim of this study is to evaluate whether the use of low-power laser (photobiomodulation) combined with ozone therapy has an effect on post-extraction (single or multiple) and post-implant insertion progress. Specifically, our objective is to evaluate how these technologies can decrease the pain and edema that influence the patient's quality of life.

Materials and methods. Eighty patients were recruited and divided into 2 groups of 40 patients each: the first group underwent extraction of one or more teeth, while the second group underwent implant insertion. These 2 groups were further divided into 4 groups, as follows: treated with LLLT only (group A), ozone therapy only (group B), LLLT + ozone therapy (group C), and a control group with no LLLT and ozone (group D). Subsequently, each patient was invited to fill some questionnaires: visual analogue scale (VAS) and the verbal rating scale (VRS). The last form had to be completed on the 7th day for the assessment of health-related quality of life (HRQoL). All the obtained data were entered in tables and a statistical analysis was made.

Results. Data were analyzed using the STATA v. 12 software (StataCorp LP, College Station, USA). The comparison of VAS and NRS scores was performed with one-way repeated-measures analysis of variance (ANOVA). The evaluation of HRQoL scores was performed using the ANOVA test. The probability to have a significant type α error was considered less than 0.05.

Discussion. Statistical analysis showed no statistical difference regarding postoperative pain and the influence of both surgical interventions on postoperative discomfort. The clinical variables strongly influence the results of VAS, NRS and HRQoL, even if the random procedure of patient inclusion can contribute to a more homogeneous and truthful result. Perhaps the number and position of the implants has less influence than the number and position of extractions: extracting an incisor or a third molar represents an operation of different entities in terms of trauma and duration of intervention.

Conclusions. The combination of ozone and laser seems to confer a positive trend in pain management of implantology operations, both in the VAS and NRS.

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Thermal and stereomicroscopical evaluation of bone cutting surfaces of different surgical instruments: 2,940-nm Er:YAG laser, piezosurgery and rotatory instruments

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Abstract

Background. In the last years, many innovations have been developed in oral surgery due to laser use. Lasers can find applications in almost all oral surgery procedures, such as incisional biopsies, excisions of hard and soft tissue lesions, frenulectomies, gingivectomies, photocoagulation of vascular lesions, dental extractions, apicoectomies, implants positioning, sinus lift surgery, and graft harvesting. The preservation of the bone and soft tissues, relatively the thermal rise and the purity of the cut, are the prerequisites for choosing the right instrument.

Materials and methods. The aim of this comparative study was to analyze in an ex vivo model the thermal elevation induced by different devices in hard tissue and the sharpness of the cutting edge in the bone. From the beginning of the surgical procedure until the end of the sample collection, the temperatures were recorded through a Forward Looking InfraRed (FLIR) camera.
Stereomicroscope is a microscope used to observe the surface of a specimen to elevate grade of magnification (up to 100X) thanks to the reflection of the light on the surface (differently from other microscopes that use the transmission of the light through the material). An advantage is that the specimen does not need a treatment before the analysis, so the sample surface is unaffected by fastening solutions.

Results. The mean temperature increase with piezoelectric surgery was 7.409°C, for the erbium laser it was 1.7°C, and for the rotary instrument it was 3.23°C. The whole area of bone smear layer for rotatory instruments was 857,155.36 μm^2, for laser it was 49,320.31 μm^2, and for piezo surgery it was 358613.62 μm^2.

Discussion. The high density of caw fibula influenced the time of osteotomy above all regarding alternative instruments not working with rotative activity, more efficient to remove high quantity of bone. The entire bone resection time for sample collection was 4 times longer with the erbium laser or piezosurgery than with the bur. The laser appeared to be a little faster than piezosurgery. The most intense temperature increase was recorded with piezosurgery and it was almost twice as long as with traditional rotary instruments and longer than with the erbium laser. The possible explanation could be the extreme hardness of the bone model: the cow fibula compared to other animal bones is very dense with a calcified bone matrix. For future experiments, it is better to choose an alternative anatomical model (pig mandibles). At the stereomicroscope analysis, the dimensions of singular bone fragments were higher in piezosurgery than laser or rotatory instrument, but the standard deviation was very big.

Conclusions. Our experiment confirms that the erbium laser surgery, above all in this new QSP technology, represents a great opportunity for both the surgeon and the patient.

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Thermal evaluation of different lasers (445 nm, 1064 nm, "nanoyag", 2,940 nm) and Quantum Molecular Resonance Scalpel in soft tissues

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Abstract

Background. In the last years, many innovations have been developed in oral surgery due to laser use. Lasers can find applications in almost all oral surgery procedures, such as incisional biopsies, excisions of hard and soft tissue lesions, frenulectomies, gingivectomies, photocoagulation of vascular lesions, dental extractions, apicoectomies, implants positioning, sinus lift surgery and graft harvesting. The preservation of the bone and soft tissues, relatively the thermal rise and the purity of the cut, are the prerequisites for choosing the right instrument. The aim of this comparative study was to analyze in an ex vivo model the thermal elevation induced by different devices in soft tissue.

Materials and methods. Comparison of 5 different cutting tools:
1) nanoYAG: 300 microfiber, 1.2 W, 25 Hz;
2) Nd:YAG: 300 microfiber, 3.5 W, 70 Hz;
3) PIO-ON450nm: 450 nm, continuous mode, power: 3 W;
4) Er:YAG: R02 handpiece, H_2O temperature = 25°C, SSP mode, 230 mJ, 30 Hz, 6.9 W;
5) RQM: CUT mode, power: 6.5, time: 70/100.

We performed 3 cuts spaced 1 cm apart, length: 2 cm depth: 2 mm.
From the beginning of the surgical procedure until the end of the sample collection the temperatures were recorded using the Forward Looking InfraRed (FLIR) thermal camera.

Results. The mean thermal increasing during the laser incision was:
- 1064 Nano:YAG: 320-µm fiber, 1.5 W, 3-ns pulse (fluence: 93.25 mJ/cm2): 10.9 – 11.2 – 9.4 (mean: 10.5°C) (rebalancing time 4.22 – 14.1 min, mean: 9.16)
- 1064 Nd:YAG (Fidelis Plus®II; Fotona, Slovenia): output power: 3.5 W; frequency: 60 Hz; fiber diameter: 320 µm (power density: 488,281 W/cm2 : 14.8 – 11.5 – 10.6 (mean: 12.3°C) (rebalancing time 2.07 – 9.27 – 13.55, mean: 8.29 min)
- 450 diode: 14 – 14.8 – 15.8 (mean: 14.8°C) (rebalancing time 8.39 – 11.15 – 8.02, mean: 9.18 min)
- 2940 Er:YAG: 9.7 – 8.6 – 5.9 (mean: 8.06°C) (rebalancing time 2.07 – 9.97, mean: 6.02 min)
- RQM: 22.9 – 19.3 – 11.6 (mean: 17.93°C) (rebalancing time 5.9 – 2.11 – 1.2, mean: 3.02 min)

Discussion. In an ex vivo model, there is no blood circulation and hydration action of saliva: for this reason, the efficiency of cutting and the temperature dissipation is lower than in the in vivo model, above all for this wavelength.
The 1064-nm laser with nanopulses induces less thermal increases than Nd:YAG (1064 nm) or diode (450 nm). The short pulses permit the cooling of the superficial and deep tissues.
The QRM causes a scission of the tissues through an electronic flow that separates the atomic or molecular

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bond without thermal increase. In this experiment, we recorded a peak temperature above 20°C. It is possible that the absence of saliva and the superficial hydration of the tongue prevented the normal passage of the electric current through which the quantum flow of electrons causes the separation of the tissue. The slowing down of the passage of the electrode between the tissues causes a very strong accumulation of heat. In any case, the restoration of the original temperature takes place more quickly than with the other instruments (3 min on average).

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The use of multiwave diode laser for the removal of vascular malformation: A case report

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Abstract

Background. Vascular malformations are congenital lesions caused by incorrect vasculogenesis. As opposed to hemangioma, they do not regress spontaneously. They are soft, painless and blueish lesions which grow proportionally with the patient. Treatment depends on location and size of the malformation. They are often removed because of esthetic reasons. Sclerotherapy, embolization, surgical resection, cryotherapy, laser therapy, and pharmacotherapy (cortisone, beta blockers) are currently the main therapy options. The paper presents a clinical case of using a diode laser to remove vascular malformation located on the lower lip by laser ablation technique and postoperative laser photobiomodulation (PBM) used to aid the healing process.

Case description. A 69-year-old woman was referred to the Department of Periodontal Diseases and Oral Mucosa Diseases in Zabrze for the removal of the lesion located on the lower lip on the right side from the midline of the body. Examination revealed painless, present since childhood, non-regularly shaped, blueish, soft lesion, measuring 10 × 5 mm. The lesion was diagnosed as a vascular malformation by medical history and clinical examination, and qualified for the removal by laser therapy. A 980-nm SmartmPro diode laser (Lasotronix, Piaseczno, Poland) was used. The treatment was contactless and the lesion was vaporized by unactivated optical fiber (320 mm) from the periphery to the center by spiral movement. Setting: output power 4.5 W, continuous operating mode. The lesion was completely removed and the wound was photobiomodulated (635 nm) postoperatively and at 3rd, 7th and 10th day after the procedure.

Results. The case report confirms the effectiveness of multiwave diode laser use for the removal of vascular malformations. Postoperative laser photobiomodulation (PBM) aids the healing process.

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Comparing four methods for diagnosis of dental caries: A clinical case report

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Abstract

Background. Dental caries is one of the most common oral mouth diseases. Global incidence rates of caries are still high; thus, early diagnosis is critical to prevent its growth.

Objectives. This clinical case report aims to compare 4 different methods of diagnosing caries in the initial stage, namely visual-tactile examination, dental photography, laser autofluorescence, and bitewing radiography.

Case description. A 28-year-old patient, generally healthy, applied for treating caries in tooth 36. In order to check the size of caries and choose its treatment method, the extent of caries was assessed using 4 different methods. For visual-tactile diagnosis, a dental mirror and probe were used. Next, dental photography (Canon camera f22, ISO 100, SS 1/200, LENS 100 mm macro) was done for visual examination.
In the third method, we used a 405-nm laser (Lasotronix, Poland) for 1 min to diagnose the caries of a tooth at the following parameters: 160 mW/cm^2, delivered energy of 5.2 J and applicator diameter of 8 mm.
The last method of caries assessment was a single bitewing X-ray (Sirona, Germany).
The X-ray and laser autofluorescence examination indicated the early stage of caries in the tooth. The other 2 methods did not clearly indicate the extent of caries.

Discussion. Early diagnosis aims to prevent the spread of caries and stop it in its early stages. An essential role in that process has control with a single X-ray bitewing. Studies have suggested that conventional visual diagnostic methods are insufficient for early diagnosis. Using a 405-nm laser can be an alternative for radiological diagnosis in the early stage of caries.

Conclusions. In this case report, laser fluorescence detected early caries similar to bitewing X-ray. The application of the autofluorescence method with a 404-nm laser can reduce patient X-ray exposure.

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Class I cavity preparation with Er:YAG (2940 nm) laser: A clinical case report

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Abstract

Objectives. To present the class I cavity preparation with the Er:YAG laser in the first molar tooth.

Case description. During the follow-up visit, a medium-depth class I caries defect was diagnosed in the molar first tooth in the mandible. The Er:YAG laser LightWalker (Fotona, Slovenia) was applied for the caries treatment. The treatment was performed in cofferdam isolation without local anesthesia.
First, the cavity was opened, and caries in the enamel was prepared with the Er:YAG laser. At this stage, the following parameters were used: energy: 250 mJ, mode: QSP (50 µs), frequency: 15 Hz, cooling: 21.6 mL/min. Then, caries within the dentin was prepared using the following parameters: energy: 180 mJ, mode: QSP (50 µs), frequency: 15 Hz, cooling: 21.6 mL/min.
Next, the enamel and dentin surface was modified with lower laser parameters: enamel conditioning (60 mJ, 30 Hz, QSP, cooling: 16.8 mL/min) and dentin conditioning (40 mJ, 15 Hz, QSP (50 µs), cooling: 16.8 mL/min). The last stage of preparing the cavity for filling was the rehydration of the dentin with water for 30 s. The OMNICHROMA composite filling (Tokuyama Dental, Japan) was placed according to general standards, occlusal adjusted, and polished.

Discussion and conclusions. The use of the laser for conservative treatment is aimed at less invasive development of the carious cavity and greater comfort of treatment due to the lack of vibrations associated with the treatment with traditional rotary tools. It works without contact and vibrations on the surface of the prepared tooth. It has a strong disinfecting effect. The laser has a selective action, significantly affecting the size of the developed cavity. The patient did not complain of pain during and after the treatment with the laser.

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Association of antimicrobial photodynamic therapy (aPDT) and platelet- and leukocyte-rich fibrin (L-PRF) in immediate dental implant surgery in contaminated alveoli with extensive bone loss

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Abstract

In patients with extensive bone loss, dental implants are a challenge for oral rehabilitation. The presence of dental infection requires prior resolution with several surgical steps. Local decontamination after tooth extraction, using antimicrobial photodynamic therapy (aPDT – low-level laser: 660 nm, 100 mW, 60 s, 6 J, Laser Duo, MM Optics, SP/Brazil; methylene blue 0.01%, Chimiolux 10 – DMC, SP/Brazil), followed by the release of growth factors and angiogenesis stimulation achieved by the use of platelet- and leukocyte-rich fibrin (L-PRF), have the potential to reduce the number of surgical interventions, being safe for patients, even in the presence of systemic diseases. The Hounsfield index variation was evaluated using the Dental Slice software (BioParts) in cone-beam computed tomography scans, performed before and 3 months after dental implant surgery (ArcsysFGM, SC/Brazil) in patients who had extensive bone loss with the presence of local infection and underwent local decontamination with aPDT and the use of L-PRF (hydration of the xenogenous graft and membrane to protect the surgical area). The change in ROI cross-sectional areas was also compared using ImageJ software before and after 3 months. The torque evaluation with the aid of the system ratchet (35 N) was assessed after the exposure of the implants, without pain, sowing the stability of the implants. With the association of these techniques in a single surgical moment, there was osseointegration of the implants, showing the potential of this protocol in critical areas, reducing the number of surgical interventions and medications (anesthesia, antibiotics, anti-inflammatories, analgesics), improving the quality of life of patients in a reduced time interval compared to the conventional protocol. Systemically compromised patients, such as those with heart disease and diabetes, may be particularly favored.

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Surgical treatment of medication-related osteonecrosis of the jaw (MRONJ) with the use of Er:YAG laser

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Abstract

Background. Medication-related osteonecrosis of the jaw (MRONJ) is a relatively new disease entity associated with the intake of anti-resorptive and angiogenesis-inhibiting drugs by patients. The widest group are bisphosphonates, which are often used in the treatment of cancers such as prostate cancer, breast cancer or multiple myeloma, and in advanced cases of osteoporosis. Treatment of the complication of MRONJ is still a challenge for modern dentistry. Development of new methods, e.g., lasers, allows for the implementation of more modern operating schemes, which may have a positive effect on the treatment outcomes.

Materials and methods. This article presents cases of patients diagnosed with MRONJ who underwent surgical treatment based on ablation of necrotized bone using the Er:YAG laser. Patients were supplemented with vitamin D in high doses of 10,000 IU per day for 1 month prior to surgery to increase plasma vitamin D3 levels – all patients had subnormal plasma D3 levels at baseline. Long-term antibiotic prophylaxis in the form of amoxicillin with clavulanic acid at a dose of 2 g per day was also administered.

Results. Three patients underwent treatment with the Er:YAG laser. Two out of 3 patients obtained very good treatment results over the course of 6 months, achieving a cure of necrosis from grade III to grade 0, thus obtaining no foci of dead bone in the affected area – pain also subsided. In one case, a slight improvement from grade III to grade II/III was obtained, while pain in the mandible affected by MRONJ was clearly reduced.

Conclusions. The use of the Er:YAG laser is undoubtedly associated with less tissue traumatization compared to conventional surgery. Medication-related osteonecrosis of the jaw is a difficult disease to treat, and the use of a laser can be an alternative to standard treatment methods. The examples show that also in the case of the Er:YAG laser, we can count on positive treatment effects. The pro-angiogenic effect and improvement of the healing process with the use of a laser is a solution that requires further research, but undoubtedly, already at this stage of knowledge, it should be implemented in the treatment of MRONJ. The use of alternative methods together with the broad spectrum of vitamin D activity can provide a specific treatment regimen compared to using only standard surgery methods.

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Impact of 405-nm laser stimulation on human fibroblast proliferation

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Abstract

Background. Current clinical needs lead to the search for methods that stimulate natural tissue regeneration, taking into account the effectiveness of treatment, but more often atraumatic and esthetic. Laser photobiomodulation, which induces intracellular metabolic changes, seems to be a minimally invasive tool to gingival fibroblast proliferations, and thus the regeneration of soft tissue.

Materials and methods. In our study, we analyzed the proliferation of human fibroblasts after laser stimulation at 405-nm wavelengths. Doses of radiation were 3 J/cm^2 (0.25 W), 25 J/cm^2 (0.50 W) and 64 J/cm^2 (0.70 W). The viability and proliferation of cells were assessed after 24, 48 and 72 h after laser irradiation.

Results. Our results show that fibroblast proliferation was increased after irradiation using energy density of 25 J/cm^2.

Conclusions. Management of soft tissue after application of the 405-nm irradiation may have a big impact on the functionality and esthetics after augmentation procedures.

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Klucz do pełnych grafików: nieoczywista klasyfikacja pacjenta

Olga Synoradzka, Justyna Musiał

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Dypl. hig. stom. Justyna Musiał,
Higienistka stomatologiczna, absolwentka min. prestiżowego Dental Hygienist Course w Hürzeler/Zuhr Academy w Monachium oraz Akademii DÜRR DENTAL w Stuttgarcie. Stale podnosi kwalifikacje zawodowe uczestnicząc w kursach zarówno w Polsce jak i zagranicą. Wykładowczyni Bańczyk&Ciapiński Implant Academy. Współtworzy przestrzeń Kobieco w Stomatologii, gdzie pomaga postawić pierwsze kroki w branży, zbudować zawód marzeń w żeńskiej energii, który przynosi satysfakcję oraz pieniądze. Prowadzi szkolenia dla asystentek implantologicznych i higienistek stomatologicznych, dając przygotowanie merytoryczne, wsparcie na drodze rozwoju zawodowego i osobistego. Współorganizatorka Konferencji Wonder Woman – We have a Voice dla Asystentek i Higienistek Stomatologicznych. Team Manager asystentek stomatologicznych w Bańczyk Stomatologia. Propagatorka pracy w lekkości, w żeńskiej energii, harmonii i partnerskich relacji.

mgr Olga Synoradzka, od 10 lat związana ze stomatologią. Certyfikowana Flow Konsultantka Talent Dynamics, propagatorka budowania zespołów w oparciu o naturalne talenty i predyspozycje oraz sprawnej komunikacji w zespole. Wykładowczyni Bańczyk&Ciapiński Implant Academy, gdzie prowadzi szkolenia dla asystentek implantologicznych i higienistek stomatologicznych. Absolwentka prestiżowego Dental Hygienist Course w Hürzeler/Zuhr Academy w Monachium. Pasjonatka strategii obsługi pacjenta, sprzedaży opartej na relacjach oraz budowania wizerunku marek premium. Swoje doświadczenie wykorzystuje zarządzając gabinetem stomatologicznym oraz tworząc przestrzeń Kobieco w Stomatologii, gdzie wraz z Justyną Musiał wspierają higienistki, asystentki, opiekunki pacjenta, rejestratorki poprzez autorskie warsztaty i szkolenia z ekspertami, przekazujące wiedzę i umiejętności, budujące kompetencje zawodowe, biznesowe i osobiste. Buduje społeczność kobiet, które chcą działać skutecznie, efektywnie i jednocześnie lekko w zgodzie ze swoimi wartościami i talentami.

Streszczenie

Od 10 lat obserwujemy i osobiście doświadczamy z jakimi wyzwaniami wiąże się zawód asystentki i higienistki stomatologicznej. Wiemy, że kompetentna i świetnie przygotowana higienistka i asystentka jest niezastąpionym członkiem zespołu. Wiemy, bo same przeszłyśmy drogę przez wszystkie szczeble rozwoju i poznałyśmy każdy aspekt gabinetu stomatologicznego.

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Pacjent implantologiczny w gabinecie higieny

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Licencjonowana higienistka stomatologiczna od 20 lat czynnie współpracująca z Implantologiem podczas zabiegów oraz mająca pod swoją opieką pacjentów implantologicznych na każdym etapie leczenia. „Implantologia jest moją wielką pasją, dlatego staram się podążać za jej szybkim rozwojem uczestnicząc w licznych szkoleniach, kongresach i sympozjach zarowno w kraju jak i za granicą." Członkini ITI i absolwentka ITI Curriculum Foundation Level. Od 2021 roku jest dyrektorem ITI Study Club Asysta i Higiena, w ktorym Higienistki/ści i Asystentki/-ci stom. mogą się rozwijać i podnosić kwalifikacje zawodowe, w oparciu o aktualną wiedzę na światowym poziomie. Jest wykładowcą w Dental Skills Institute, gdzie prowadzi autorskie kursy zarowno dla Lekarzy z zakresu przygotowania gabinetu i organizacji zabiegow implantologicznych oraz dla Asystentek/-ow stom. z zakresu czynnej asysty podczas zabiegow implantologicznych. „Uwielbiam to co robię "

Streszczenie

Bardzo dynamiczny i sukcesywny rozwój dziedziny stomatologii estetycznej, jaką jest implantologia, sprawiają, że liczba pacjentów zainteresowanych leczeniem implantologicznym wzrasta. Wraz z postępem w implantologii wzrasta rola Higienistki/-ty stom. Wykład przedstawia kompleksowe ujęcie zagadnienia dotyczącego pracy Higienistki/-ty stom. z pacjentem implantologicznym, na każdym etapie procesu leczenia. Zostaną również poruszone kwestie związane z etapami wizyty higienizacyjnej, ze specyfiką budowy tkanek wokół implantów oraz prac implanto-protetycznych, a także odpowiednim doborem narzędzi i sprzętu, aby zapewnić długoterminowy sukces leczenia.

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Guided Enamel Regeneration: znaczenie skutecznego wykrywania wczesnej próchnicy

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Streszczenie

Próchnica jest jedną z najbardziej rozpowszechnionych chorób na świecie, dotyka blisko 2,3 mld ludzi. Opóźnione wykrycie i zbyt późne zgłaszanie się pacjentów do gabinetów stomatologicznych powoduje, że jedynym sposobem na wyleczenie zęba jest usunięcie mas próchnicowych i odbudowanie zniszczonych tkanek z wykorzystaniem obecnie stosowanych technik.

Wczesna identyfikacja próchnicy w połączeniu z innowacyjnymi technologiami opartymi na peptydach, pozwala specjalistom na zaoferowanie zachowawczych i zapobiegawczych metod leczenia, aby nie naruszać struktury zęba i opóźnić lub uniknąć zastosowania inwazyjnych procedur.

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Techniki i procedury wybielania zębów w gabinecie

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Prezes Sekcji Profilaktyki i Promocji Zdrowia Polskiego Towarzystwa Stomatologicznego. Członek rady naukowej kwartalnika "Asysta Dentystyczna". Ambasadorka ogolnopolskiej kampanii: Polska mówi #aaa. Członek Rady Naukowej 2 i 3 Kongresu Unii Stomatologii Polskiej. Pomysłodawczyni i organizatorka Ogólnopolskiego Zjazdu Higienistek i Asystentek Stomatologicznych. Uczestniczka i prelegentka licznych krajowych i zagranicznych konferencji, sympozjow, targow stomatologicznych i zjazdów zespołów medycznych. Autorka publikacji w branżowej prasie medycznej, współautorka książki "Vademecum asysty dentystycznej. Profilaktyka w gabinecie" oraz "Ortodoncja dla higienistek stomatologicznych". Praktykuje jako higienistka stomatologiczna w MichalskiMed w Gorzowie Wlkp. Mama czwórki pociech.

Streszczenie

Podczas wykładu omówiony zostanie proces wybielania zębów, wpływ nadtlenku wodoru na tkanki twarde, wskazania i przeciwskazania do wykonania zabiegu oraz możliwe powikłania. Wykładowca przeprowadzi przegląd dostępnych metod wybielania wraz z case study.

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Najnowocześniejsze rozwiązania oraz innowacyjne, nieinwazyjne podejście do profesjonalnej profilaktyki w gabinecie higieny

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Dyplomowana higienistka stomatologiczna, od 14 lat prowadzi gabinet higieny w Klinice Śmigiel w Katowicach. Absolwentka Medycznego Studium nr 1 w Katowicach na kierunku Higiena Stomatologiczna oraz Wyższa Szkoła Pedagogiczna TWP w Warszawie na kierunku Edukacja Zdrowotna z rehabilitacją. Aktywna uczestniczka wielu konferencji dot. profilaktyki stomatologicznej w Polsce i za granicą. Master Trener Swiss Dental Academy, współzałożycielka i członkini zarządu stowarzyszenia Polska Akademia Profilaktyki Stomatologicznej. Konsultantka merytoryczna magazynu Asysta Dentystyczna. Redaktor naczelna magazynu Polskiej Akademii Profilaktyki Stomatologicznej. Wykładowczyni i szkoleniowiec. Autorka kilkudziesięciu publikacji w branżowych czasopismach, współautorka książki Vademecum Asysty Dentystycznej.

Streszczenie

Świat wokół nas intensywnie się rozwija, powstają coraz to nowocześniejsze urządzenia mające na celu ułatwienie i usprawnienie naszego życia. Innowacje dotyczą również gabinetu higieny stomatologicznej. W trakcie wykładu omówiony zostanie ultranowoczesny protokół zarządzania biofilmem, Guided Biofilm Therapy. Przedstawione zostaną unikatowe technologie dające możliwość dotarcia w najtrudniejsze miejsca, niedostępne w trakcie użytkowania tradycyjnych metod profilaktycznych.

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Laser a biostymulacja

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Dyplomowana higienistka stomatologiczna aktywnie działająca w zawodzie od 2018 roku. Specjalistka w opiece higienizacyjnej pacjentow periodontologicznych. Asystentka stomatologiczna przy zabiegach z zakresu protetyki, implantologii oraz periodontologii, zajmująca się również opieką pooperacyjną nad pacjentami. Uczestniczka szkoleń zawodowych, angażująca się również w przygotowywanie kursów stomatologicznych. Na co dzień pasjonatka zdrowego stylu życia i górskich wycieczek.

Streszczenie

Często niepokój pacjenta przed wykonaniem chirurgicznego zabiegu stomatologicznego, powoduje unikanie wizyty w gabinecie. Pomocny w tym problemie jest Gabinet Higieny wyposażony w innowacyjny sprzęt laserowy. Umożliwi on zmianę nastawienia i odpowiednie przygotowanie pacjenta do pokonania obaw, i przejścia do kolejnych kroków leczenia dentystycznego. Laseroterapia to dzisiaj ważny aspekt współczesnego leczenia, ponieważ zdrowie jamy ustnej to jeden z czynników determinujących jakość życia. Obecnie zawód higienistki nabiera nowych kompetencji i możliwości. Ciągły postęp rozwoju technik w stomatologii daje możliwości pracy nowatorskimi urządzeniami, czyli zastosowania laserów niskiej mocy, które dają perspektywę szerszego wachlarza usług naszym pacjentom. Ciągłe poszerzanie wiedzy, samodoskonalenie i dokształcenie się w tematyce swojej specjalności jest niezwykle ważne, gdyż jest to warunek sukcesu nie tylko gabinetu higieny, ale również całego zespołu stomatologicznego. Terapia laserem niskoenergetycznym jest absolutnie bezpieczna i bezbolesna. Wzmaga procesy naprawcze, regeneracyjne, przyspiesza odnowę włókien kolagenowych, nabłonka, poprawia ukrwienie i przyspiesza wzrost fibroblastów. Efektem wtórnym jest działanie przeciwbólowe, przeciwzapalne, przeciwobrzękowe czy regeneracyjne. Uzupełnieniem wachlarza możliwości leczenia fotobiomodulacji, czyli PBM, jest zabieg znoszenia nadwrażliwości zębiny, podnoszenie progu bólu przed zabiegami skalingu ultradźwiękowego, przyspieszenie resorpcji znieczulenia i uczucia drętwienia wargi po znieczuleniu, czy działanie przeciwbólowe po wybielaniu zębów. Wykład pokaże zastosowanie lasera diodowego i neodymowego wraz z parametrami i punktami aplikacji w tych wszystkich procedurach, które na co dzień wykonuje asysta i higienistka stomatologiczna u swoich pacjentów.

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Laser 405 nm jako niezbędnie narzędzie pracy nowoczesnej higienistki

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Ukończył Gdańską Akademię Medyczną w 2006 roku. Uczestniczył w licznych kursach w kraju i za granicą. Jest członkiem Brytyjskiego Towarzystwa Stomatologii Estetycznej (BCDS) ukończonym w 2012 r. w Londynie. Jako lekarz dentysta szczególnie interesuje się stomatologią estetyczną oraz implantologią, którą zajmuje się od 2008 roku. Jest absolwentem prestiżowej uczelni na Uniwersytecie we Frankfurcie im Goethego oraz wykładowcą szkoleń z fotografii stomatologicznej. Student European Master Degree in Oral Laser Applications (EMDOLA) na Uniwersytecie Medycznym im. Piastów Śląskich we Wrocławiu.

Streszczenie

Zastosowanie lasera 405 nm w diagnostyce pozwala wyprzedzić widoczność zmian zanim będą widoczne w świetle i poszerza zakres możliwości pracy zarówno w praktyce zachowawczej (diagnostyka próchnicy), protetycznej (szczelność prac protetycznych), ortodontyczne (usunięcie resztek klejów po mocowaniu zamków), chirurgicznych (diagnostyka zmian i realnego zasięgu w jamie ustnej), czy gabinetach higieny (wybielanie, komunikacja z pacjentem, usuwanie złogów). Pokazane na wielu przykładach zastosowanie stanowi silny argument, aby uznać to narzędzie we współczesnej stomatologii jak główne narzędzie współczesnego gabinetu stomatologicznego.

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Laserowa terapia fotodynamiczna

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Dyplomowana higienistka specjalizująca się w zabiegach profilaktycznych połączonych z instruktażem prawidłowej higieny. Wykonuje procedury przy użyciu nowoczesnych urządzeń. Pracująca głównie z pacjentami implantologicznymi i periodontologicznymi. Współprowadząca szkolenia z zakresu laseroterapii w gabinecie higieny. Uczestniczka wielu szkoleń z dziedziny stomatologii w kraju i na świecie. Miłośniczka branży beauty. W wolnych chwilach aktywnie spędza czas na świeżym powietrzu.

Streszczenie

Laseroterapia to jedno z większych osiągnięć współczesnej stomatologii. Coraz szerzej wykorzystuje się leczenie światłem w gabinetach higieny oraz podczas codziennych procedur stomatologicznych. Leczenie wiązką światła laserowego to jedno z innowacyjnych metod postępowania u pacjentów, którzy boją się dentysty. Laser może być wykorzystywany m.in. w przypadku leczenia aft, opryszczki wargowej, ropni przyzębnych, czy jako zaawansowany etap leczenia periodontitis. Praca laserem w gabinecie higieny, daje możliwość poszerzenia zakresu pracy i nowych kompetencji higienistki stomatologicznej.

Laser wspomaga leczenie zmian zapalnych poprzez antybakteryjne wykorzystanie terapii fotodynamicznej aPDT (antimicrobial Photodynamic Therapy). Wpływa na terapię przeciwwirusową i przeciwgrzybiczną. Jest to małoinwazyjna metoda leczenia powierzchownego, bez przerywania ciągłości tkanek, tak więc całkowicie bezpieczna. Stosujemy tę formę leczenia całkowicie bezpiecznie u kobiet w ciąży, u pacjentów z wysokiego ryzyka, dzieci, do leczenia zapalenia dziąseł, do recallu wizyt periodontologicznych po wyprowadzeniu aktywnej formy periodontitis, do odkażania próchnicy, jak również do leczenia opryszki wargowej, nadżerek, ran i otarć po klamrach protezy czy aparatu ortodontycznego. Warto jest inwestować w wiedzę i nowoczesny sprzęt, gdyż dobrze zaplanowany i urządzony gabinet higieny ma szansę wspomóc praktykę dentystyczną w podwyższeniu poziomu satysfakcji z jakości leczenia pacjenta, związanego nie tylko z jego zaopiekowaniem, ale również z profesjonalną terapią na najwyższym światowym poziomie.

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Laser a periodontitis

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Dyplomowana higienistka stomatologiczna z wieloletnim doświadczeniem i stażem w pracy z pacjentem. Uczestniczka wielu krajowych i zagranicznych szkoleń. Zajmuje się indywidualnym szkoleniem higienistek i asystentek stomatologicznych, z którymi dzieli się swoją pasją i zamiłowaniem do zawodu. Prowadzi kursy z periohigienizacji, wybielania oraz laseroterapii w pracy higienistki. Zdobywczyni tytułu „Higienistka roku 2017". Na co dzień pracuje w gabinecie PerioCare Laser Institute gdzie zajmuje się głównie opieką nad pacjentem periodontologicznym. W swojej codziennej praktyce wprowadza nowoczesne techniki laseroterapii.

Streszczenie

Zapalenie dziąseł i przyzębia to choroba infekcyjna, która nieleczona może prowadzić do postępującej utraty przyczepu i kości, jak również ostatecznie doprowadzić do utraty zębów. Znajomość anatomii i patomechanizmu powstawania tych chorób jest warunkiem do skutecznej edukacji pacjentów i motywacji do leczenia podczas wizyt higienizacyjnych. Wykorzystanie lasera w leczeniu zapalenia dziąseł i zapalenia przyzębia jest dziś niezwykle przydatne w prowadzeniu pacjenta w gabinecie higieny. Wykorzystujemy zwykle lasery diodowe do leczenia pogłębionych kieszonek przyzębnych po zakończonej fazie higienizacyjnej oraz po skalingu poddziąsłowym kiretami, w przypadku periodontitis. Kluczowe jest wyczyszczenie kieszonek przyzębnych ze wszystkich zmineralizowanych złogów, dlatego standardem w postępowaniu powinno być użycie urządzeń z punktową amplitudą drgań jak system Vector (Durrdental, Niemcy). Dopiero wówczas dezynfekcja kieszeni laserem wysokoenergetycznym o długości fali 810 nm do 970–980 nm jest skuteczna i długotrwała. Wykład pokaże krok po kroku prowadzenie pacjenta periodontologicznego z praktycznym uwzględnieniem procedur laserowych.

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