JLAD

JOURNAL OF LASER-ASSISTED DENTISTRY

Focal Point

Minimally-Invasive Flapped & Unflapped Management of Peri-Implantitis Using Er,Cr:YSGG Laser

Page 13

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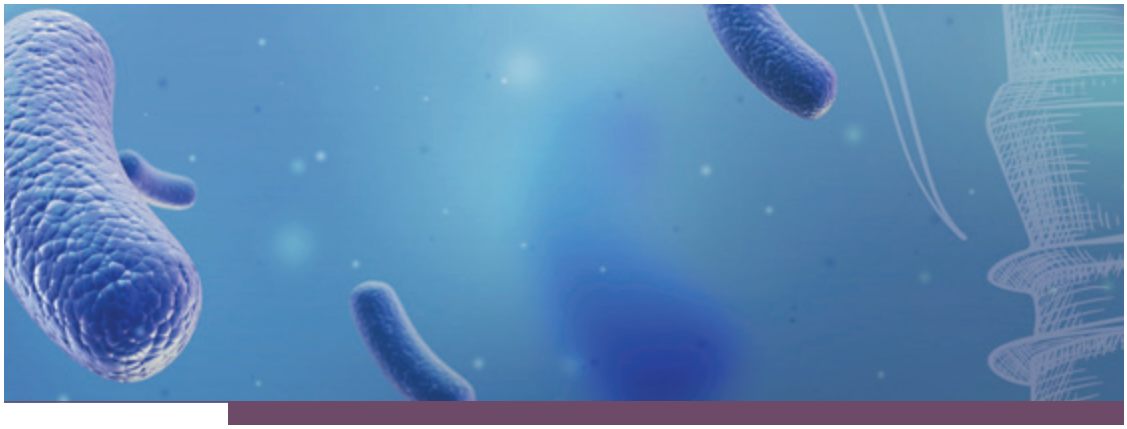

FOCAL POINT

Minimally-Invasive Flapless and Flapped Management of Peri-Implantitis

Failing and ailing implants continue to be a growing concern in dentistry, with the prevalence of peri-implantitis estimated at 10% of implants. Our focal point features a peri-implantitis case series with a minimally-invasive approach.

SEE THE FULL STORY ON PAGE 13

TRENDS IN LASER DENTISTRY

Lasers were first introduced to dentistry in the 1960s, where they were primarily used for research purposes. In the 1980s, the first dental lasers for mainstream use were commercialized. In the thirty years since, we now have multiple types of lasers with various wavelengths to achieve our desired treatment outcomes. About 25% of all dentists worldwide own a soft-tissue laser, however, less than 1% worldwide own an all-tissue laser, even though there are more than five dozen indications for use for oral procedures. As laser technology has and is influencing our life in many ways, its advancements in the field of dentistry will continue to play an integral role in patient care for years to come.

Given that our profession is evolving, there are always new trends on the horizon. Some of these trends are cosmetic dentistry, minimally-invasive dentistry, and dental implants. Lasers play an integral role in all these areas and how we, as clinicians, can provide a higher standard of care for our patients.

So in this, our third issue of Journal of Laser-Assisted Dentistry (JLAD), we wanted to share some of the latest information, research findings, techniques and tips focusing on emerging trends in dentistry, from Dr. Rana Al-Falaki's article, "Minimally-Invasive Management of Peri-Implantitis" and Alina Sivriver's original research on pre-initiated diode laser tips, to the "The Top 7 Procedures to Learn with your WaterLase iPlus 2.0", by Dr. Glenn van As. This issue is dedicated to communicating helpful information about the latest trends.

In addition to our editorial focus, we've also included our regular features: WCLI news and events, profiles of two up-and-coming WCLI members and Maiman's Vault, where we discuss the first hard-tissue laser to break through in the industry.

From the entire editorial board, we hope you enjoy the issue and we welcome your suggestions for improving our publication or for articles or research summaries that you would like to see in future issues.

Christopher J. Walinski, DDS
EDITOR & EXECUTIVE DIRECTOR OF THE WCLI
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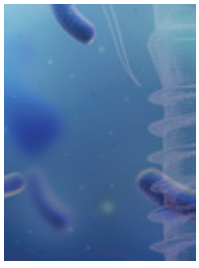
CHRISTOPHER J. WALINSKI, DDS
EDITOR Dr. Walinski is a founder of the WCLI as well as an author, instructor and innovator in laser dentistry. He is currently the Executive Director of the WCLI.



COVER IMAGE
Peri-implantitis is an infectious disease that causes inflammation of the surrounding gum and bone of an already integrated dental implant, leading to the loss of supporting bone. Our cover reflects the prevalence of bacteria in osteotomy and potential for peri-implantitis

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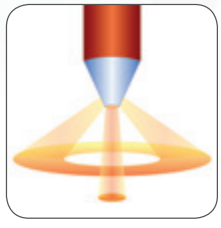

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ACHIEVING DENTAL ANALGESIA

A PROTOCOL FOR PAINLESS, CONSERVATIVE TREATMENT

RESEARCHERS EVALUATE TECHNIQUES and optimal parameters of Er,Cr:YSGG laser use in delivering predictable, painless, restorative cavity preparation without the aid of injectable local anesthesia.

1. PEER-REVIEWED PUBLICATION

Photomedicine and Laser Surgery is the essential journal for cutting-edge advances and research in phototherapy, low-level laser therapy (LLLT), and laser medicine and surgery. The Journal delivers basic and clinical findings and procedures to improve the knowledge and application of these techniques in medicine.

2. UNDERSTANDING ANALGESIA

The term "odontophobia" was coined to identify feelings of aversion and fear associated with a dental experience. These emotional attitudes make life very difficult for both the patient and the dentist because of the negative impact on health status for the former and wasted time for the latter. In this study, researchers set out to evaluate the techniques and optimal parameters of Er,Cr:YSGG laser that allow the performance of a predictable, painless (or with very limited discomfort) restorative treatment without the aid of local anesthesia, in order to obtain patient comfort, cooperation, and compliance.

3. UNIVERSITY-LED RESEARCH TEAM

Dr. Steven Parker is a professor and researcher at the University of Genoa, Italy and led the study research team. Dr. Parker has published numerous articles related to the advancement in laser dentistry. The study also included Dr. Riccardo Poli from the University of Genoa.

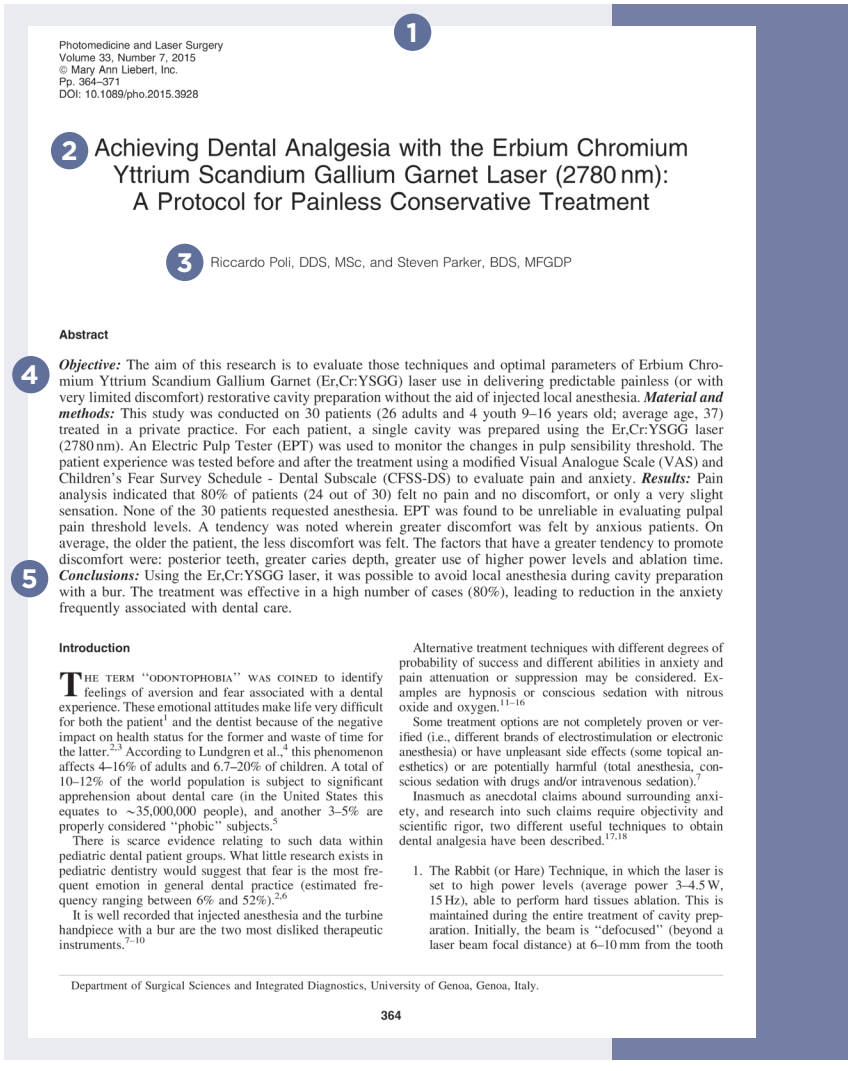
4. MATERIALS AND METHODS

This study was conducted on 30 patients (26 adults and 4 youth 9-16 years old; average age, 37) treated in a private practice. For each patient, a single cavity was prepared using the Er,Cr:YSGG laser (2780 nm). An Electric Pulp Tester (EPT) was used to monitor the changes in pulp sensibility threshold. The patient experience was tested before and after the treatment using a modified Visual Analogue Scale (VAS) and Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) to evaluate pain and anxiety.

5. RESULTS

Pain analysis indicated that 80% of patients (24 out of 30) felt no pain and no discomfort, or only a very slight sensation. None of the 30 patients requested anesthesia. EPT was found to be unreliable in evaluating pulpal pain threshold levels. A tendency was noted wherein greater discomfort was felt by anxious patients. On average, the older the patient, the less discomfort was felt. The factors that have a greater tendency to promote discomfort were: posterior teeth, greater caries depth, greater use of higher power levels and ablation time.

Using the Er,Cr:YSGG laser, it was possible to avoid local anesthesia during cavity preparation with a bur. The treatment was effective in a high number of cases (80%), leading to reduction in the anxiety frequently associated with dental care.



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Photomedicine and Laser Surgery
Volume 33, Number 7, 2015

Pp. 364–371
DOI: 10.1089/pho.2015.3928

2 Achieving Dental Analgesia with the Erbium Chromium Yttrium Scandium Gallium Garnet Laser (2780 nm): A Protocol for Painless Conservative Treatment

3 Riccardo Poli, DDS, MSc, and Steven Parker, BDS, MFGDP

Abstract

4 ***Objective:*** The aim of this research is to evaluate those techniques and optimal parameters of Erbium Chromium Yttrium Scandium Gallium Garnet (Er,Cr:YSGG) laser use in delivering predictable painless (or with very limited discomfort) restorative cavity preparation without the aid of injected local anesthesia. ***Material and methods:*** This study was conducted on 30 patients (26 adults and 4 youth 9–16 years old; average age, 37) treated in a private practice. For each patient, a single cavity was prepared using the Er,Cr:YSGG laser (2780 nm). An Electric Pulp Tester (EPT) was used to monitor the changes in pulp sensibility threshold. The patient experience was tested before and after the treatment using a modified Visual Analogue Scale (VAS) and Children's Fear Survey Schedule - Dental Subscale (CFSS-DS) to evaluate pain and anxiety. ***Results:*** Pain analysis indicated that 80% of patients (24 out of 30) felt no pain and no discomfort, or only a very slight sensation. None of the 30 patients requested anesthesia. EPT was found to be unreliable in evaluating pulpal pain threshold levels. A tendency was noted wherein greater discomfort was felt by anxious patients. On average, the older the patient, the less discomfort was felt. The factors that have a greater tendency to promote discomfort were: posterior teeth, greater caries depth, greater use of higher power levels and ablation time.

5 ***Conclusions:*** Using the Er,Cr:YSGG laser, it was possible to avoid local anesthesia during cavity preparation with a bur. The treatment was effective in a high number of cases (80%), leading to reduction in the anxiety frequently associated with dental care.

Introduction

THE TERM "ODONTOPHOBIA" WAS COINED to identify feelings of aversion and fear associated with a dental experience. These emotional attitudes make life very difficult for both the patient[1] and the dentist because of the negative impact on health status for the former and waste of time for the latter.[2,3] According to Lundgren et al.,[4] this phenomenon affects 4–16% of adults and 6.7–20% of children. A total of 10–12% of the world population is subject to significant apprehension about dental care (in the United States this equates to ~35,000,000 people), and another 3–5% are properly considered "phobic" subjects.[5]

There is scarce evidence relating to such data within pediatric dental patient groups. What little research exists in pediatric dentistry would suggest that fear is the most frequent emotion in general dental practice (estimated frequency ranging between 6% and 52%).[2,6]

It is well recorded that injected anesthesia and the turbine handpiece with a bur are the two most disliked therapeutic instruments.[7–10]

Alternative treatment techniques with different degrees of probability of success and different abilities in anxiety and pain attenuation or suppression may be considered. Examples are hypnosis or conscious sedation with nitrous oxide and oxygen.[11–16]

Some treatment options are not completely proven or verified (i.e., different brands of electrostimulation or electronic anesthesia) or have unpleasant side effects (some topical anesthetics) or are potentially harmful (total anesthesia, conscious sedation with drugs and/or intravenous sedation).[7]

Inasmuch as anecdotal claims abound surrounding anxiety, and research into such claims require objectivity and scientific rigor, two different useful techniques to obtain dental analgesia have been described.[17,18]

1. The Rabbit (or Hare) Technique, in which the laser is set to high power levels (average power 3–4.5 W, 15 Hz), able to perform hard tissues ablation. This is maintained during the entire treatment of cavity preparation. Initially, the beam is "defocused" (beyond a laser beam focal distance) at 6–10 mm from the tooth

Department of Surgical Sciences and Integrated Diagnostics, University of Genoa, Genoa, Italy.

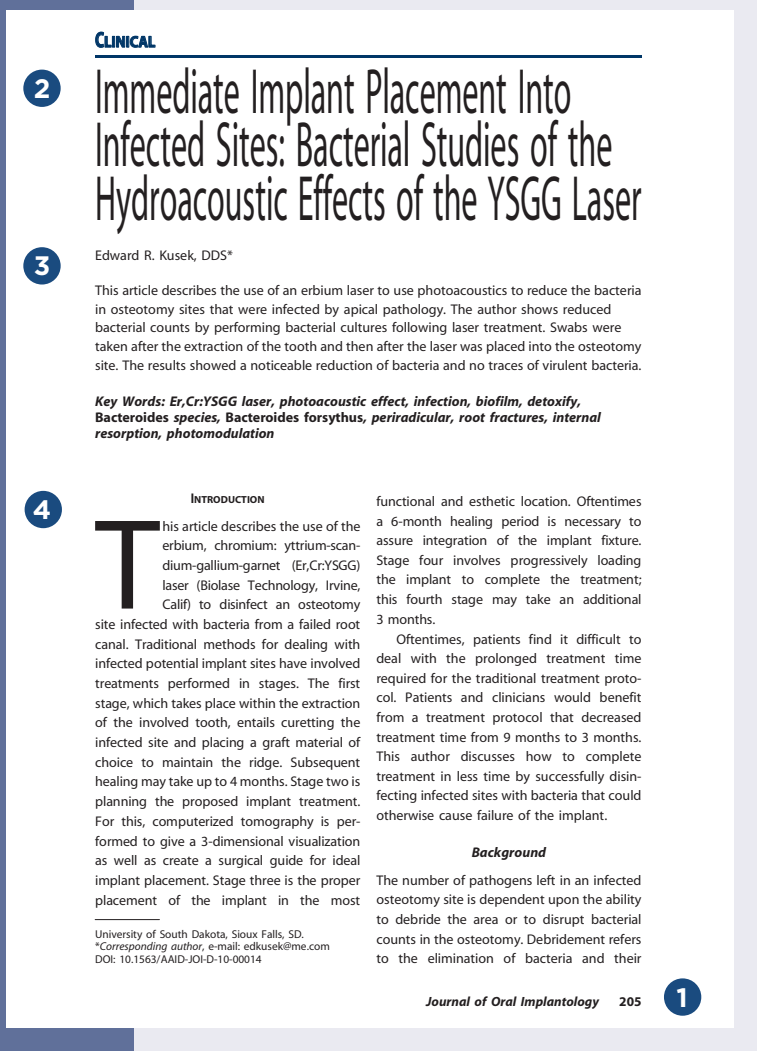
LASER HYDROACOUSTIC EFFECTS ON BACTERIA IN OSTEOTOMY SITES

CLINICAL ANALYSIS OF THE USE OF AN ER,CR:YSGG LASER

using photoacoustics to reduce the bacteria in osteotomy sites that were infected by apical pathology.

1. PEER-REVIEWED PUBLICATION

The Journal of Oral Implantology, published bimonthly, is the official publication of the American Academy of Implant Dentistry and the first and oldest journal in the world devoted exclusively to implant dentistry.



CLINICAL

2 Immediate Implant Placement Into Infected Sites: Bacterial Studies of the Hydroacoustic Effects of the YSGG Laser

3 Edward R. Kusek, DDS*

This article describes the use of an erbium laser to use photoacoustics to reduce the bacteria in osteotomy sites that were infected by apical pathology. The author shows reduced bacterial counts by performing bacterial cultures following laser treatment. Swabs were taken after the extraction of the tooth and then after the laser was placed into the osteotomy site. The results showed a noticeable reduction of bacteria and no traces of virulent bacteria.

Key Words: Er,Cr:YSGG laser, photoacoustic effect, infection, biofilm, detoxify,* Bacteroides *species,* Bacteroides forsythus, *periradicular, root fractures, internal resorption, photomodulation

4 INTRODUCTION

This article describes the use of the erbium, chromium: yttrium-scandium-gallium-garnet (Er,Cr:YSGG) laser (Biolase Technology, Irvine, Calif) to disinfect an osteotomy site infected with bacteria from a failed root canal. Traditional methods for dealing with infected potential implant sites have involved treatments performed in stages. The first stage, which takes place within the extraction of the involved tooth, entails curetting the infected site and placing a graft material of choice to maintain the ridge. Subsequent healing may take up to 4 months. Stage two is planning the proposed implant treatment. For this, computerized tomography is performed to give a 3-dimensional visualization as well as create a surgical guide for ideal implant placement. Stage three is the proper placement of the implant in the most functional and esthetic location. Oftentimes a 6-month healing period is necessary to assure integration of the implant fixture. Stage four involves progressively loading the implant to complete the treatment; this fourth stage may take an additional 3 months.

Oftentimes, patients find it difficult to deal with the prolonged treatment time required for the traditional treatment protocol. Patients and clinicians would benefit from a treatment protocol that decreased treatment time from 9 months to 3 months. This author discusses how to complete treatment in less time by successfully disinfecting infected sites with bacteria that could otherwise cause failure of the implant.

Background

The number of pathogens left in an infected osteotomy site is dependent upon the ability to debride the area or to disrupt bacterial counts in the osteotomy. Debridement refers to the elimination of bacteria and their

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DOI: 10.1563/AAID-JOI-D-10-00014

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2. DIFFERENT METHOD FOR TREATING INFECTED POTENTIAL IMPLANT SITES

The traditional method for treating infected potential implant sites is a four stage process (usually nine months) where patients oftentimes find it difficult to deal with the prolonged treatment time. The author discusses how to complete treatment in less time by successfully disinfecting sites infected with bacteria that could otherwise cause failure of the implant.

3. REAL-WORLD RESEARCH

Dr. Edward Kusek privately practices in Sioux Falls, S.D. and performed the cases mentioned in this report. Dr. Kusek has previously published twelve articles on laser implant dentistry and is truly passionate about continuing education and the fields of implant and restorative dentistry.

4. MATERIALS AND METHOD

The study design used 100 root dentin blocks from the buccal and lingual surfaces of extracted human molars.
The specimens were randomly assigned to 10 test groups according to the surface treatment. The mechanism for measuring variability in hardness is the longitudinal Knoop hardness test.

OVERVIEW OF THE STUDY

The number of pathogens left in an infected osteotomy site is dependent upon the ability to debride the area or to disrupt bacterial counts in the osteotomy. Debridement refers to the elimination of bacteria and their related irritants from the osteotomy space by means of copious irrigation via syringe and/or with internally irrigated drills during the preparation of the osteotomy site.

The effect on implant dentistry with laser energy is the usage of radiation and water to act as a means to destroy bacteria. The energy produced is an explosion of water energy. The purpose of this article is to show in 10 case reports, that the level of bacterial reduction of osteotomy sites via hydroacoustic energy

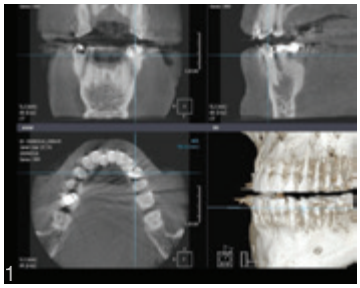


FIGURE 1. Case #1 cone beam computerized tomography showing infection apically for tooth #21.

FIGURE 2. SurgiGuide placement to aid in the osteotomy site.

is reduced. These case reports are to provide evidence for what has been clinically observed. The author did not receive remuneration from any company to provide these case reports.

STUDY RESULTS

The implants were tested in all cases after the 3 month healing period with Periotest to determine whether they had osseointegrated. All 10 cases were successful and have been in function for a year or more over the course of this study. Nine of the 10 cases demonstrated a noticeable reduction in anaerobic bacteria, and specific virulent types were not seen in the cultures.

The use of laser technology has been shown to have a significant effect upon areas of infected sites. Hydroacoustic effects are said to be very effective in preventing bacterial growth. Further studies have shown that this type of laser energy denatures endotoxins by effectively cleaving molecules. Bacteria and their endotoxins are the agents that trigger periodontal disease, and as such, are key targets for laser therapy.

STUDY CONCLUSION

Based on the 10 cases presented, it can be inferred that this technique provides an immediate means of placing dental implants within an infected site following the aforementioned laser treatments.

Using traditional methods, these cases would have taken three times longer for completion than those attained with this laser-assisted technique.

FIGURE 3. YSGG laser for achieving the hydroacoustic effect used to treat the infected site.

FIGURE 4. An aerobic swabbing to collect bacterial culture.

FIGURE 5. Case #6 final radiographic after seating the finished case.

FIGURE 6. Using the YSGG laser to stimulate tissue.

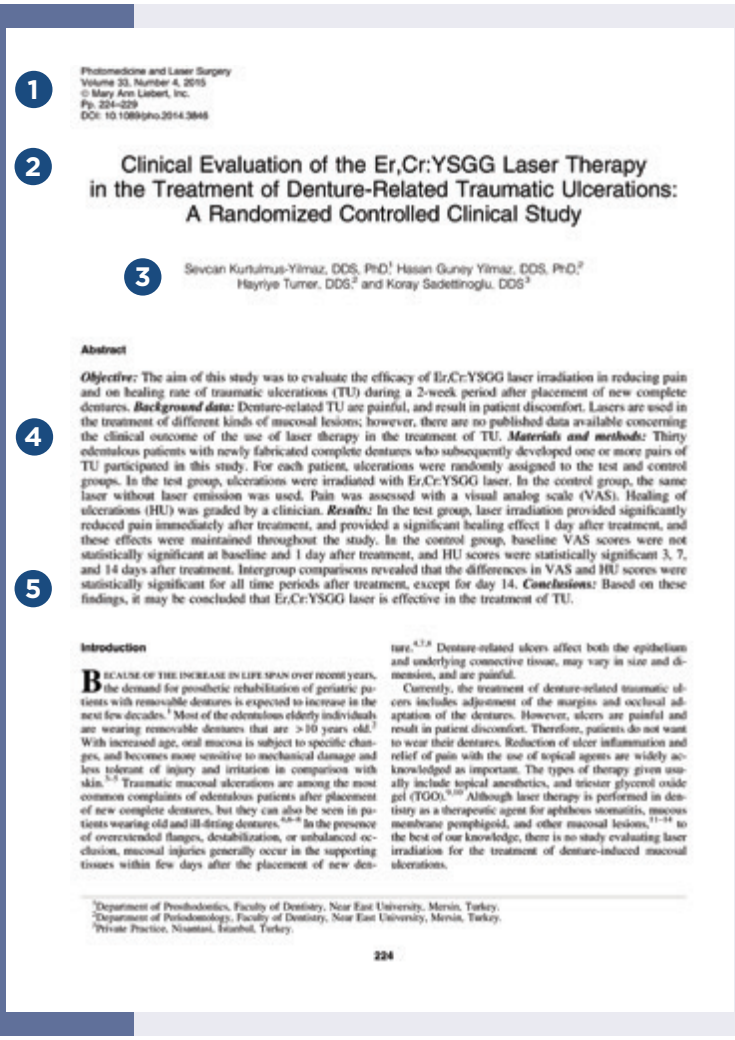
FIGURE 7. Using a diode laser to garner the effects of photomodulation.

LASER TREATMENT
FOR DENTURE-RELATED TRAUMATIC ULCERATIONS

RESEARCHERS EVALUATE THE EFFICACY
of Er,Cr:YSGG laser irradiation in reducing pain and on the healing rate of traumatic ulcerations during a two-week period after placement of new complete dentures.

1. PEER-REVIEWED PUBLICATION

Photomedicine and Laser Surgery is the essential journal for cutting-edge advances and research in phototherapy, low-level laser therapy (LLLT), and laser medicine and surgery. The Journal delivers basic and clinical findings and procedures to improve the knowledge and application of these techniques in medicine.



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Photomedicine and Laser Surgery
Volume 33, Number 4, 2015
© Mary Ann Liebert, Inc.
Pp. 224–229
DOI: 10.1089/pho.2014.3846

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Clinical Evaluation of the Er,Cr:YSGG Laser Therapy in the Treatment of Denture-Related Traumatic Ulcerations: A Randomized Controlled Clinical Study

3

Sevcan Kurtulmus-Yilmaz, DDS, PhD,[1] Hasan Guney Yilmaz, DDS, PhD,[2] Hayriye Tumer, DDS,[2] and Koray Sadettinoglu, DDS[3]

Abstract

Objective: The aim of this study was to evaluate the efficacy of Er,Cr:YSGG laser irradiation in reducing pain and on healing rate of traumatic ulcerations (TU) during a 2-week period after placement of new complete dentures. ***Background data:*** Denture-related TU are painful, and result in patient discomfort. Lasers are used in the treatment of different kinds of mucosal lesions; however, there are no published data available concerning the clinical outcome of the use of laser therapy in the treatment of TU. ***Materials and methods:*** Thirty edentulous patients with newly fabricated complete dentures who subsequently developed one or more pairs of TU participated in this study. For each patient, ulcerations were randomly assigned to the test and control groups. In the test group, ulcerations were irradiated with Er,Cr:YSGG laser. In the control group, the same laser without laser emission was used. Pain was assessed with a visual analog scale (VAS). Healing of ulcerations (HU) was graded by a clinician. ***Results:*** In the test group, laser irradiation provided significantly reduced pain immediately after treatment, and provided a significant healing effect 1 day after treatment, and these effects were maintained throughout the study. In the control group, baseline VAS scores were not statistically significant at baseline and 1 day after treatment, and HU scores were statistically significant 3, 7, and 14 days after treatment. Intergroup comparisons revealed that the differences in VAS and HU scores were statistically significant for all time periods after treatment, except for day 14. ***Conclusions:*** Based on these findings, it may be concluded that Er,Cr:YSGG laser is effective in the treatment of TU.

4

5

Introduction

BECAUSE OF THE INCREASE IN LIFE SPAN over recent years, the demand for prosthetic rehabilitation of geriatric patients with removable dentures is expected to increase in the next few decades.[1] Most of the edentulous elderly individuals are wearing removable dentures that are >10 years old.[2] With increased age, oral mucosa is subject to specific changes, and becomes more sensitive to mechanical damage and less tolerant of injury and irritation in comparison with skin.[3–5] Traumatic mucosal ulcerations are among the most common complaints of edentulous patients after placement of new complete dentures, but they can also be seen in patients wearing old and ill-fitting dentures.[6,6–8] In the presence of overextended flanges, destabilization, or unbalanced occlusion, mucosal injuries generally occur in the supporting tissues within few days after the placement of new denture.[4,7,8] Denture-related ulcers affect both the epithelium and underlying connective tissue, may vary in size and dimension, and are painful.

Currently, the treatment of denture-related traumatic ulcers includes adjustment of the margins and occlusal adaptation of the dentures. However, ulcers are painful and result in patient discomfort. Therefore, patients do not want to wear their dentures. Reduction of ulcer inflammation and relief of pain with the use of topical agents are widely acknowledged as important. The types of therapy given usually include topical anesthetics, and triester glycerol oxide gel (TGO).[9,10] Although laser therapy is performed in dentistry as a therapeutic agent for aphthous stomatitis, mucous membrane pemphigoid, and other mucosal lesions,[11–14] to the best of our knowledge, there is no study evaluating laser irradiation for the treatment of denture-induced mucosal ulcerations.

[1]Department of Prosthodontics, Faculty of Dentistry, Near East University, Mersin, Turkey.
[2]Department of Periodontology, Faculty of Dentistry, Near East University, Mersin, Turkey.
[3]Private Practice, Nisantasi, Istanbul, Turkey.

2. DIFFERENT METHOD FOR TREATING TRAUMATIC ULCERATIONS

Currently, the treatment of denture-related traumatic ulcers includes adjustment of the margins and occlusal adaptation of the dentures. However, ulcers are painful and result in patient discomfort. Therefore, patients do not want to wear their dentures. Reduction of ulcer inflammation and relief of pain with the use of topical agents are widely acknowledged as important.

Lasers are used in the treatment of different kinds of mucosal lesions; however, there is no published data available concerning the clinical outcome of the use of laser therapy in the treatment of traumatic ulcerations.

3. UNIVERSITY-LED RESEARCH TEAM

Dr. Sevcan Kurtulmus-Yilmaz is a part of the prosthodontic faculty at the Near East University, Mersin, Turkey and led the study research team. Dr. Yilmaz has published many articles related to the advancement in prosthetics. The study also included Drs. Hasan Guney Yilmaz and Hayriye Tumer, from Near East University, and Dr. Koray Sadettinoglu, a private practicing dentist in Turkey.

4. MATERIALS AND METHODS

Thirty edentulous patients with newly fabricated complete dentures who subsequently developed one or more pairs of traumatic ulcerations participated in this study. For each patient, ulcerations were randomly assigned to the test and control groups. In the test group, ulcerations were irradiated with Er,Cr:YSGG laser. In the control group, the same laser without laser emission was used. Pain was assessed with a visual analog scale (VAS). Healing of ulcerations (HU) was graded by a clinician.

5. STUDY RESULTS

In the test group, laser irradiation provided significantly reduced pain immediately after treatment, and provided a significant healing effect one day after treatment, and these effects were maintained throughout the study. In the control group, baseline VAS scores were not statistically significant at baseline and one day after treatment, and HU scores were statistically significant three, seven, and 14 days after treatment. Intergroup comparisons revealed that the differences in VAS and HU scores were statistically significant for all time periods after treatment, except for day 14.

Based on these findings, it may be concluded that Er,Cr:YSGG laser is effective in the treatment of TU.

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By Alina Sivriver, Research Engineer, Guest Contributor

INTRODUCTION & OBJECTIVES

Diode lasers emerged in dentistry during the late 1980s and in the subsequent years evolved into versatile, compact and reliable technology for treatment of soft tissue. They are used primarily for three basic applications: a "knife" to cut soft tissue, transmit energy heat to kill bacteria, and for low level laser therapy (biostimulation).

Laser energy is delivered either via a fiber or replaceable tip to the treatment site. To use a diode laser to cut and ablate soft tissue, the energy must be concentrated at the end of the tip, and not transmit through. To do this, the diode tip is initiated, often with a cork or articulating paper. Full initiation of the tip is a technique sensitive procedure.

To initiate a diode tip is to physically change the characteristics of the glass at the distal end of the tip such that laser energy is absorbed in the tip end then is transmitted through it. The absorbed energy is converted to heat at the tip, creating a hot, glowing tip, which can cut through soft biological tissues. To help provide better clinical outcomes by eliminating the variables with manually initiated tips and increase reliability and ease of use, BIOLASE funded research into better tip initiation techniques. It is argued that tips with higher absorption will cut soft tissues more efficiently and that the cutting ability will be independent of tissue type.

FIGURE 1. Cross-section of a cut made at 1.5 W, CW, 0.5 mm/s in pork muscle.

FIGURE 2. Still of Cu pre-initiated tip cutting beef tongue at 1.5 W, CW, 1.0 mm/s.

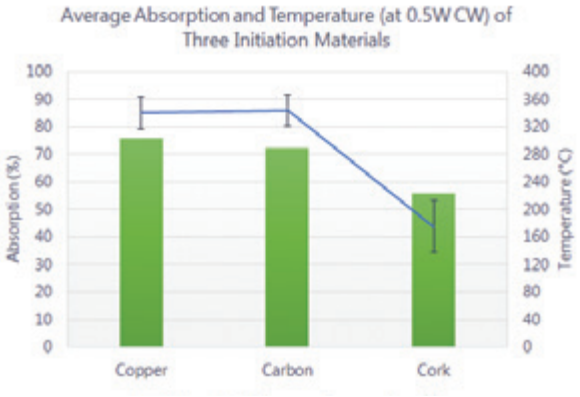
A decision was made to also bring the initiating process in house to eliminate multiple variables with the technique sensitive process and to produce quality controlled initiated tips.

The goal of the project was to create repeatable initiation that does not dissipate during a procedure. To accomplish this, different types of initiating materials were tested.

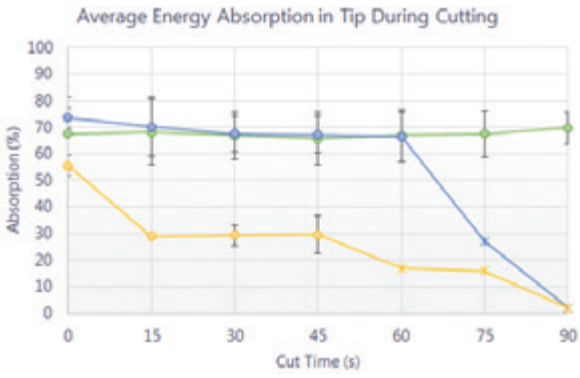
COMPARISON OF TIP INITIATION MATERIALS METHODS

Initiating materials tested included cork, pressed carbon tablet, carbon in solution, aluminum (Al) flakes in solution, and copper (Cu) flakes in solution. The aim was to find an initiating material which provides consistent, repeatable initiation and good cutting ability. A quantifiable method was developed:

- Surgical diode tips of the same diameter were initiated in each material for 5 seconds at 1.5 W power output CW.
- Transmission (and thereby, absorption) was measured after initiation.
- Temperature was measured with an infrared camera at 0.5 W setting (low power setting was used to avoid reaching the detection limit of the camera).
- Initiated tips were used to cut pork muscle (97% lean) and beef tongue tissues to compare cutting ability on lightly and darkly pigmented tissues. Cutting was controlled by a motor-driven positioning system set to make 1 cm long cuts at slow, medium, and high speeds (0.5 mm/s, 1.0 mm/s, 1.5 mm/s, respectively).
- Changes in tip transmission during successive 15-second long cuts were measured.
- Qualitative observations were also made from cuts made by hand.



GRAPH 1. Comparison of initiation materials.



GRAPH 2. Comparison of performance of different initiating materials over time.

RESULTS & DISCUSSION

Of the initiators tested, Cu and Al metals in solution gave the best performance. Cork and carbon initiators showed inconsistent initiation, requiring multiple initiation attempts to reach good initiation quality and at least 50% energy absorption at the tip. *Graph 1* depicts the results from absorption and temperature measurements from three of the initiating materials. Al and Cu initiated the tips on the first attempt and results from the two metals were similar. Absorption in Cu initiated tips was measured and results were between 60-90% absorption. Initiation durability results are presented in *Graph 2*. Circles represent the average energy absorption in the tip, measured every 15 seconds during cutting, and the standard deviation is represented by the error bars. For cork and carbon, multiple tips lost initiation after 45–60 seconds. At later time points, when not enough tips survived to calculate standard deviation, the data is presented by asterisks. Cu initiated tips lasted at least 1.5 minutes, and were able to cut any tissue (i.e. pork muscle in *Figure 1*, beef tongue in *Figure 2*).

Cu Pre-Initiated Tip

Cork-Initiated Tip

FIGURE 3. Comparison of cutting with a Cu pre-initiated tip (Top) and a cork-initiated tip (Bottom) at 1 W, 2 W, 3 W (Left to Right) CW

Examples of cuts made with pre-initiated tips can be seen in *Figures 1 and 2*. Each cut was made with a computer-controlled positioning system at the set speeds indicated, slow 0.5 mm/s and medium 1.0 mm/s. These tips can reach temperatures above 200° C at low power outputs (0.5 W CW). Above this temperature, the tip can cut smoothly and swiftly through tissue without the dragging effect that denatured collagen can have. At temperatures of 100-200° C, collagen converts to glucose, which creates adhesion between the tissue and the tip. *Figure 3* shows a series of cuts made by hand and demonstrates that cutting with a pre-initiated tip can offer better control, less charring, and cleaner edges than cutting with a cork initiated tip. Because of its high efficiency, the pre-initiated tip can provide more precise cutting at lower power settings compared to the cork initiated tip.

Although the results of Al and Cu were similar, knowing that the reflectivity of Al is lower than that of Cu, Cu was chosen as the initiator for pre-initiated tips.

Pre-initiated tips were then tested for biocompatibility, specifically: cytotoxicity, irritation, and 48 hour sensitization in accordance with GLP protocols and passed all tests. The tips were considered non-toxic, non-irritants, and non-sensitizers.

CONCLUSIONS

Results of the comparative test of different initiating materials pointed to the Cu solution being the top initiator by a wide margin compared to the organic initiators. Cu has close to 100% reflection of 800nm-1 µm light, nearly the same as gold. NASA uses gold to reflect infrared light from the sun. In comparison, Al reflects approximately 10% less than Cu in the 940 nm range. The irregularly shaped Cu particles in solution coat the tip end, and, upon initiation, melt the tip glass, creating an absorptive layer at the end of the tip. Once a tip is initiated, part of the energy is blocked, or converted to heat. BIOLASE's pre-initiated tips absorb 60-90% of the laser energy, converting it to heat, and transmit the rest. Thus, the Cu pre-initiated tip is able to cut and apply photobiomodulation to the tissue.

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MINIMALLY-INVASIVE FLAPLESS AND FLAPPED MANAGEMENT OF PERI-IMPLANTITIS **USING Er,Cr:YSGG LASER**

By Drs. Rana Al-Falaki and Mark Cronshaw

Peri-implantitis is defined as an inflammatory process around an implant which includes soft-tissue inflammation and progressive loss of supporting bone. It is a destructive inflammatory condition initiated by bacterial insult.[1] The prevalence of peri-implantitis is estimated to be present in 10% of implants and 20% of patients during 5-10 years after implant placement.[2] Other risk factors contributing to peri-implantitis include patients with a previous history of periodontitis and those with active periodontitis, smokers, poor plaque control or inability to clean effectively, residual cement, and also possibly occlusal factors, genetics, diabetes, alcohol consumption, and rheumatoid arthritis.[3]

There are many similarities between periodontal disease and peri-implantitis although there are also key differences. A wider range of pathogens have been implicated in peri-implantitis as well as different patterns and rates of disease progression. The management of periodontitis and peri-implantitis are very similar and are based on the principles of the elimination of inflammation and the removal of infected tissues as well as the elimination of biofilm and smear layer.[4-7] Although long-term outcomes of periodontal treatment have been shown to be very effective, long-term outcomes for the treatment of peri-implantitis appear to be much less predictable.

There are relatively few reports in the literature of the application of the Er,Cr:YSGG laser in the non-surgical and surgical management of periodontitis.[8-12] However, studies to date demonstrate that pocket depths around infected teeth typically reduce by half after a single application of the 2780 nm laser in a non-surgical protocol.[8-10] This technique involves the removal of infected pocket lining, outer epithelial removal, removal of granulation tissue, root surface debridement and laser modification. All of these steps can be achieved using a 500 um diameter 60 degree radial firing periodontal tip (BIOLASE).

This paper reports on a case series of implants treated in a similar protocol to that of minimially-invasive periodontal therapy technique described above, but with additional steps taken to decontaminate the implant surface. The paper also illustrates cases where a flapless technique has been found to be unsuccessful, and demonstrates a surgical protocol that can be used to achieve a successful outcome.

Continued on page 14.

MATERIALS AND METHODS:

Patients with a clinical diagnosis of peri-implantitis based on clinical and radiographic findings were eligible for inclusion in this analysis. Implants with at least one site >4 mm and evidence of radiographic bone loss compared to baseline radiographs were included. No exclusions were made based on smoking or medical history. A total of 68 sites around 28 implants, in 11 consecutive patients were treated. The implant fixtures were not removed for treatment.

CASE 1

1a. Bone loss on distal and aspects of UR4 implant

1b. Bone fill around implant after one treatment using flapless technique

1c. 8 mm pocket before treatment

1d. 3 mm probing after treatment

1e. Infill of tissue and less recession over time

THE TREATMENT PROTOCOL ARE AS FOLLOWS:

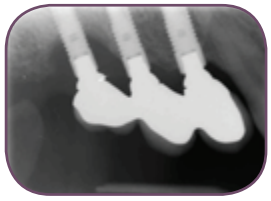
1. Administration of local anesthetic.
2. The pockets were treated using an Er,Cr:YSGG laser by inserting a 14 mm long, 500 µm diameter radial firing tip (RFPT5) into the pocket, at a setting of 1.5 W power, 30 Hz, Water 50%, Air 40%, 50 mj/pulse, 60 µs pulse duration (H mode, short pulse). The tip was inserted into the pocket at an angle parallel to the long axis of the implant, as much as the anatomy allowed. It was fired starting from the base of the pocket, in alternating vertical and horizontal slow sweeping movements, working up to the gingival margin, allowing water and laser energy to contact all surfaces of the implant. This was continued until no further granulation tissue was seen to be coming out of the pocket, and no other debris or residual cement was observed. This step can take anywhere between 5-15 minutes, depending on the surrounding bone loss and extent of the defect.
3. A titanium curette was then used along the bony surfaces and the inside of the pocket to ensure any remaining granulation tissue was removed.
4. Second application of laser, repeating the first step, but this application is much briefer, to ensure removal of all tissue and debris and allow the laser energy to contact all implant surfaces that may not have been exposed due to the presence of granulation tissue.
5. The laser tip was then removed from the pocket and run outside the pocket, parallel to the tissue, to remove the outer epithelium surrounding the implant by a distance of at least 5 mm from the gingival margin.
6. Bleeding was stopped using compression with water moistened damp gauze.
7. A 940 nm diode laser (BIOLASE) was then applied to the outside of the surrounding tissue level with the gingival margin, at a setting of 1.4 CW for 30 seconds using the contoured bleaching handpiece.
8. Patients were advised to brush as normal starting the next day and use interdental brushes. Probing depths were measured after two months and six months, and bleeding on probing recorded at each stage.

In cases where it was not possible to insert the laser tip past the restoration down into the pocket, such as over-contoured crowns or compromised access in the mouth, this method was not possible to carry out. Also, in such cases, often the restorations are cemented rather than screw-retained, making their removal very difficult. In these cases of difficult access, along with cases of no keratinised tissue being around the implants, a flapless minimally-invasive approach is unlikely to be successful. For such cases, flapped surgery is necessary.

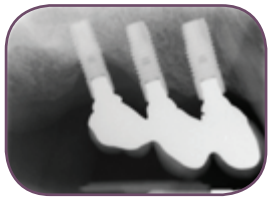
THE STEPS OF SUCH A FLAPPED SURGERY PROCEDURE ARE AS FOLLOWS:

1. Raise flap using laser or scalpel blade.
2. Removal of granulation tissue from all around the implant and surrounding defect using an end-firing tip (MZ6, 14 mm) at laser settings of 1.5 W, Water 75%, Air 50%, 30 Hz, H mode, 45-60 degree angle relative to the implant surface.
3. Decontamination of the implant surface using an end firing tip (MZ6, 14 mm) at laser settings of 1 W, Water 75%, Air 50% , 50 Hz, H mode, 60 degree angle to clean in between the threads effectively.
4. Decontamination of the inside of the flap using same setting as Step 3 above.
5. Placement of bone augmentation materials e.g. Bio-Oss and BioGide membrane (Geistlich Pharma) if bone grafting is deemed suitable. This is not a suitable treatment modality if there is no infrabony component to the defect.
6. Consider implantoplasty (the smoothing down of implant threads on supra-bony component of the defect).
7. Replacement of flap and suture in place.
8. Low level laser therapy using 940 nm diode laser (3-5 J/cm^2 administered as a 1 cm spot size at 1 CW for 20-30 seconds).
9. Avoid brushing for one week, and supplement with mouthwash. May also consider administration of systemic antimicrobials.
10. Avoid probing for at least three months, but ensure patient is able to maintain adequate plaque control.
11. Continue with supportive therapy through regular follow-up appointments, including probing on a three- or four-month basis.

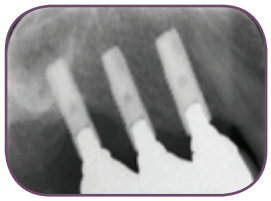
CASE 2



2a. Radiographs before treatment



2b. After seven months



2c. After 20 months showing continued bone fill around the implant

2d. 3 mm probing depth mesially

2e. 3 mm probing depth distally after treatment with considerable recessions. Pockets had reduced from 10 mm and 9 mm respectively

Continued on page 16.

FIGURE 1.

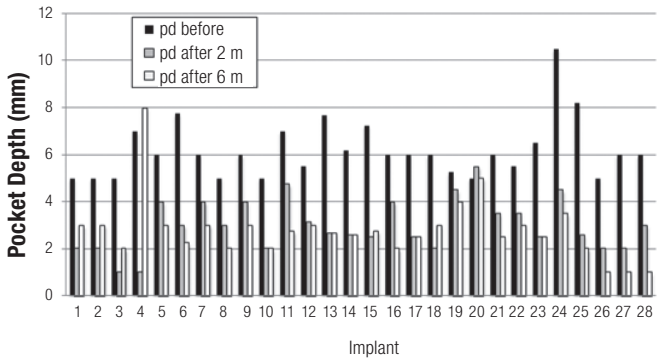


FIGURE 2.

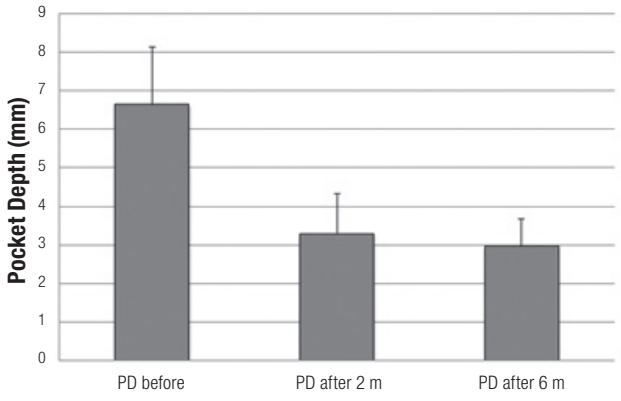
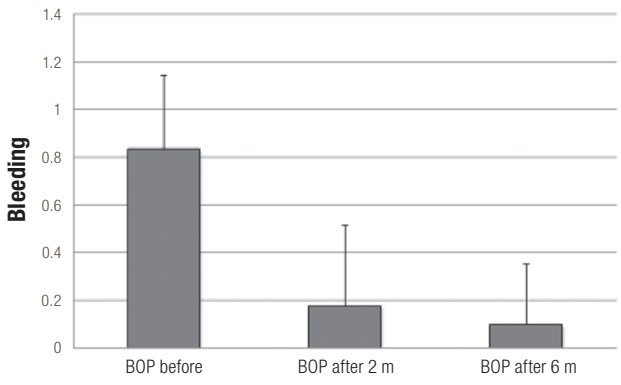


FIGURE 3.



RESULTS:

The case series involved 11 patients. The age range of patients was 27 to 69 years old, with a mean of 55.9 years. Two were smokers and no patients had compromising medical conditions. The mean probing depth reductions for all implants are shown in *Figure 1*. There was a marked reduction in pocket depths with almost all sites treated. One implant (implant 4) showed a marked reduction at two months, but complete relapse by six months. Two other implants (19 and 20, from the same patient) showed no significant reduction following treatment. These three implants had no keratinized tissue around them and mobile margins due to muscle pull.

Baseline pocket depths ranged from 5-12 mm, with a mean SD of 6.64 +/-1.48 mm, and the mean probing depth after two months was 3.29 mm +/- 1.02 mm, and after six months 2.97 +/- 0.7 mm. Reductions from baseline to both two months and six months were highly statistically significant ($p<0.001$ by repeated measure ANOVA and Bonferroni post test). *Figure 2.* 88% of sites were bleeding at baseline, 18% after two months, and 10% after six months. These were statistically significant ($p<0.001$ by Friedman's test and Dunn's post test). *Figure 3.*

An interesting observation over time was that recession that occurred immediately after treatment gradually reduced, with less exposure of threads, and radiographically, some bone fill was observed when the peri-implantitis was initially associated with vertical defects.

DISCUSSION

The results of the case series demonstrate that treatment resulted in the resolution (<4 mm) of 91% of sites, and unresponsive outcomes in only three of 28 implants. In addition, 10% of sites were bleeding on probing after six months. The use of Er,Cr:YSGG laser as a non-surgical aid to the management of peri-implantitis seems to be effective in the majority of cases in this analysis, with possible reasons for lack of long-term success having been identified—those being access and lack of keratinized tissue.

A number of recent systematic reviews have addressed the issue of whether or not lasers may be useful in the management of peri-implantitis. [11-14] Kotsakis et al. concluded that non-surgical laser therapy should be considered as Phase I therapy, helping to reduce inflammation but not reduce pocket depths, and that following on from this, a second phase of treatment consisting of surgery is needed.[13] However, they did not include the Er,Cr:YSGG laser in this analysis, and also pointed out some limitations of such a review, due to the high heterogeneity and low number of studies. Another limitation was the lack of information in studies about power setting, tips used, angulations, and doses, to sufficiently be able to compare success rates. Aoki

et al. nicely summarizes the current literature along with possible laser tissue interactions using different laser wavelengths in the management of peri-implantitis.[15]

The majority of published research on lasers and peri-implantitis have looked at the Er,YAG (wavelength 2940 nm), and CO_2 (wavelength 10600 nm).[11-14] These have been identified as being safe wavelengths to use around implants in that they are able to remove biofilm and infected tissue without collateral adverse thermal or structural damage.[16-18] The majority of studies report optimal reductions in pocket depths and CAL gains in the management of peri-implantitis through surgical means, in conjunction with augmentative bone materials and barrier membranes in some cases.[19,6] However, an ideal method to decontaminate the infected implant surface has not yet been determined.[7, 20-22]

The Er,Cr:YSGG (wavelength 2780 nm) is similar to the Er:YAG, with the primary chromophore of both being water. On exposure to laser energy at this wavelength, water expands explosively by a factor of 1600x in 1/50th of a second and this rapid expansion produces beneficial clinical effects by virtue of the effective removal of biofilm, destruction of bacteria, and the ability to remove infected tissues without damage to superficial tissues, remove calculus, and remove the peri-implant pocket lining.[23-29,30] Laser applications to debride contaminated implant surfaces in the erbium wavelengths have been subject to animal and a limited number of clinical studies.[31-39] Indeed, the case illustrated here (Surgical Case) shows a successful treatment outcome following a surgical protocol using the Er,Cr:YSGG with no other antibacterial or disinfecting agents. To date, however, there is no consensus on the appropriate use of lasers in the management of peri-implantitis.

The radial firing tip and its laser-tissue interactions have been a subject of considerable study in endodontics, being used to debride and disinfect root canals through a powerful hydro-kinetic effect at a level of energy below the threshold that could result in damage to implant surfaces or adjacent vital tissues.[40] The rapid pulsing of the laser creates an expanding wave front which interferes with reflected waves from earlier pulses resulting in amplification. This powerful hydraulic event appears to be potentially of benefit as an aid in the decontamination and removal of smear layer in the confines of a root canal.[16-18, 23-29]

The radial firing tip has been applied in the non-surgical management of moderate to advanced periodontitis[8-11,24] and in infrabony defects,[42] and shown to produce considerable reductions in probing depths, bleeding on probing and CAL gains.

Previous literature using the Er:YAG laser in a non-surgical setting for the management of peri-implantitis has been reported with the use of an end-firing tip, and only reported pocket depth reductions of 0.8 to 0.9 mm.[11-14] By contrast, this case series demonstrated significant probing depth reductions of 3.5 mm.[43,44] One possible theory for this marked difference in findings may indeed be the use of the radial firing tip, and its different energy distribution that results in a different biological effect in the confined environment of a pocket in a flapless technique. The results of this case series warrant further investigation through well-designed clinical controlled trials.

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Dr. Rana Al-Falaki, MRD, has been a UK registered specialist in periodontics for over 10 years. She has been an undergraduate and post-graduate clinical lecturer, and a consultant at Barts and The London School of Medicine and Dentistry. Most of her time is now spent in specialist practice, as well as lecturing worldwide. She was the first UK periodontist to use lasers in her daily practice. She has a fellowship in Laser Dentistry and advanced certification in the use of WaterLase. She is conducting research on its applications and also lectures both in the UK and internationally on the subject and is pioneering its use in this field. She has published articles and presented research on the use of Er,Cr:YSGG laser, on both periodontology and peri-implantitis, is an honorary lecturer for Guys Dental School, University of London, a guest lecturer for the Laser MSc in Genoa University, a visiting professor to the Medical University of Taipei, a key opinion leader and laser trainer in the UK, and founder of the Global Periodontal Laser User Society.

Dr. Mark Cronshaw, B.Sc., BDS, LDS RCS (Eng), M.Sc., FWCLI, FIADFE trained at Guys Hospital in London. He graduated in 1981 with a degree in biomedical sciences and completed his dental studies in 1984. Dr. Cronshaw has used lasers in his daily clinical practice since 2005 and he has recently formalized his dental laser education by undertaking the Master of Science program at Genoa University. Following graduation in November of 2014 he has been appointed a Professor a.c. and lectures on oral laser applications courses Worldwide on behalf of the Faculty of Medicine at the University of Genoa. He was awarded the Fellowship of the World Clinical Laser Institute in 2009 and he is highly active in laser education as a trainer and lecturer here in the UK. Dr. Cronshaw is on the peer review panel of the journal Lasers in Medical Science.

LASER WHITENING STEP-BY-STEP

WHITER TEETH AREN'T JUST FOR MOVIE STARS AND POLITICIANS.

It seems that everyone is in search of a brighter and more engaging smile. According to Statistic Brain Research Institute, "the tooth whitening industry rakes in over $11 billion annually." Obviously, there is serious interest in this form of self-improvement.

By Heidi Christopher, RDH

Sixty-four percent of dental offices in the United States already offer chairside whitening. If you're among them—congratulations! You're offering your patients a service they want. If you're part of the 36% not offering whitening, consider the benefits of laser whitening. It's faster than other in-office options and can help build your hygiene program.

This guide shows the step-by-step procedure for whitening using the EPIC diode laser and LaserWhite20 whitening gel. As with all treatment plans, the dentist should first perform a complete intra-oral exam and evaluate current x-rays to qualify the patient for the whitening procedure and discuss expected results.

1 GETTING READY

- Measure and record the shade of the patient's teeth using a Vita shade guide
- Clean teeth surfaces using a pumice that does not contain glycerin. Try to remove any dental plaque and superficial stains, being careful not to abrade the soft tissue.
- Apply Vaseline to the patient's lips and insert check retractors. Use cotton rolls for increased protection and comfort.

PRO TIP:
Take a photo of the 'before' shade to help the patient visualize the results.

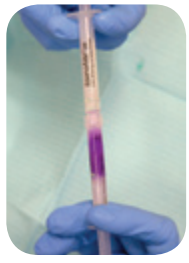
2 APPLY LIQUID DAM

- Rinse and air dry the teeth and gingival tissue.
- Initiate the flow of the liquid dam by discharging a small amount onto a mixing pad or other surface.
- Starting at one end of the arch, apply the liquid dam to the gingiva to build a strip about 2 mm wide by 1-1.5 mm thick. At embrasures, express the liquid dam through the opening, filling the space completely.
- Protect one extra tooth at each end of the arch beyond those that will be whitened.
- Cure the liquid dam in sections with a standard curing light for 5-10 seconds per arch.

PRO TIP:
Be sure to extend the material at least half a millimeter onto the enamel, and cover any exposed root surfaces.

PRO TIP:
If the liquid dam runs, cure after every two to three teeth.

3 MIX WHITENING GEL



- Remove caps from both the activator and base gel syringes. Connect the two syringes together by twisting one onto the other until fully tightened.
- Tightly grasp the plungers of both syringes. Mix whitening gel by pressing the contents of the lavender syringe into the clear syringe. Reverse and repeat 25 times. Make sure gel is consistent throughout the syringe, and continue mixing if necessary.
- Push the mixed gel into the gel base barrel, then unscrew the syringes from each other.
- Screw on a brush applicator tip.

PRO TIP:
For added comfort, apply Vaseline on the mucosa in areas not protected by liquid dam.

96% of patients are concerned about appearance.

#2 Whitening is the second most popular procedure.

40% of aesthetic dentists perform whitening.

*American Academy of Cosmetic Dentistry

4 APPLY GEL

- Divide the upper and lower arches into four treatment sites.
  - Q1 Upper right quadrant (4-8)
  - Q2 Upper left quadrant (9-13)
  - Q3 Lower left quadrant (20-24)
  - Q4 Lower right quadrant (25-29)
- Dry the teeth by wiping them with gauze or a cotton roll.
- Evenly apply a thin layer (approx. 1 mm) of the mixed LaserWhite20 gel over all four quadrants.
- Use only half of the gel in this application, saving the remaining gel for the second application.
- Make sure that the gel does not contact the patient's gingiva, tongue, or lips.
- Check patient for sensitivity or discomfort. If sensitivity continues, use the desensitizer included in the kit.*
- **Do not proceed if sensitivity continues.**

PRO TIP:
To confirm consistency of application thickness, the lavender color should be even and not streaky.

PRO TIP:
Dispense half of the gel into mixing cup and use a small paintbrush for application if easier.

5 LASER APPLICATION

- Ensure everyone in the room is wearing the appropriate eye protection and press the Ready button on the EPIC.
- Place the whitening handpiece, with disposable clear cap attached, about 1mm from Q1 without contacting the gel.
- Activate the laser by pressing down on the foot pedal and hold the handpiece in place for the duration of laser delivery of 200 J, about 30 seconds.
- Repeat for Q2, Q3 and Q4.
- Repeat for all quadrants one more time (each quadrant will receive two doses).
- Remove gel using a surgical suction tip. Flush lightly with an air and water spray to remove any residual gel, if necessary.

PRO TIP:
Allow gel to remain on teeth for a minimum of five minutes after last laser cycle.

*Desensitizer not available in Canada.

6 SECOND APPLICATION

- Replace brushed applicator tip with new tip and reapply LaserWhite20 gel using above steps, using remaining half of gel.
- Repeat laser application steps above. Each quadrant will now have four doses of laser energy.
- Allow gel to sit five minutes after last laser cycle and remove.

7 FINAL STEPS

- Rinse teeth thoroughly with water from syringe.
- Remove liquid dam by sliding the tip of an explorer or forceps between the gingiva and the barrier, carefully lifting it away.
- Use an explorer or floss to remove any residual liquid dam from interproximal spaces and rinse again.
- Perform a final polish with a fine grade paste to give luster and shine to the teeth.
- Apply a moist cotton gauze over the gums and teeth and wait a few minutes to rehydrate the tissue and enamel.
- Measure and record the shade using a Vita Shade Guide Brightness Scale. Compare initial shades with final shades and discuss with patient.

PRO TIP:
Take a photo of patient and post to social media, with the patient's permission of course.

PRO TIP:
Use a new lip balm branded with the office information and put in the patient's take home kit.

ABOUT THE AUTHOR

Heidi Christopher currently practices as a clinical hygienist, owns a staffing service, TDH Employment Referrals, specializing in placement of dental hygienists with advanced skills. Heidi actively provides laser training as a AGD PACE CE provider through her own company and serves as an instructor & lecturer for the International Center for Laser Education (ICLE) and the World Clinical Laser Institute (WCLI).

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THE TOP 7 PROCEDURES
TO LEARN WITH YOUR WATERLASE IPLUS 2.0

THE PURCHASE OF A NEW WATERLASE IPLUS LASER is a significant event for clinicians both financially and with respect to training. For many, the process of learning how to integrate the new technology can be overwhelming and can be difficult to even know where to start. The key to successfully implementing the laser into your office stems from a commitment to learning new procedures and being open to new ways of performing traditional dentistry with the laser. Put a tip like the MZ5 or MZ6 into the gold handpiece, have the laser in standby mode ready to go with the water filled up in the room you are working in and start learning how to use the laser for these seven basic procedures. Suddenly, you will rely daily on the laser for many other procedures as well.

Remember, you have to walk before you run, so let's get started with understanding these basic core procedures which can be done in most dental practices.

By Glenn A. van As, DMD

1 CLASS V RESTORATIONS

With "baby boomers" reaching retirement, this generation is unlike their predecessors, in that they often still have most of their teeth. With advancing age, recession of gingiva, medication usage and other factors, root caries has become a common problem.

In most instances, these lesions can be treated with laser ablation of both soft- and hard-tissue with only a topical anesthetic. Although dentists are fine with needles and drills, it's the patients who are looking for alternatives. Providing reduced anesthetic restorations in multiple quadrants with the iPlus laser, while removing overhanging soft-tissue, caries, and etching the enamel while using only topical anesthetic in most instances, becomes a real win-win for both patient and practitioner.

SUGGESTED SETTINGS FOR CLASS V RESTORATIONS

Soft-tissue ablation:
MZ6 tip: 1.5 watts, 50Hz, water 20%, air 20%, H mode (unless tissue very inflamed, then S mode).

Hard-tissue ablation:
MZ5 tip: 0.8 -2.0 W, 8 -15 Hz, 1.5- 2.0 W with air 40-60%, water 60-80%, H mode

Pre-op | Immediate post-op | Five weeks post-op

2 FRENECTOMY

The frenectomy procedures which many of us learned in dental school were called the "Z-Plasty" and involved a blade incision down to the periosteum which was Z-shaped. This was followed by sutures to close the wound. Frenectomy was a procedure that many dentists would not attempt, and one that many patients found difficult due to the perception of it being "surgical" along with the fact that sutures were used to obtain primary closure.

The introduction of lasers into soft-tissue surgery has offered new possibilities because they offer the advantage of providing a precise and clean surgery, with reduced bleeding, a decreased need for sutures, and shorter healing times compared with conventional techniques. The improvement in postoperative comfort and healing makes this technique particularly useful for very young patients, and for those teenagers requiring a revision of their frenum in conjunction with ongoing orthodontic treatment to close midline diastemas.

SUGGESTED SETTINGS FOR FRENECTOMIES

No local anesthetic:
MZ6 tip: 1.5 W, 20Hz, water 12% , air 10% , H mode.

Local anesthetic:
MZ6 tip: 3.0 W, 40Hz, water 5%, air 10%, H mode.

Hemostasis (where possible):
MZ6 tip: 0.5 W, 50Hz, water Off, air 10%, S mode.

Pre-op | Intra-op | Two weeks post-op

3 FIBROMA

The irritation (traumatic) fibroma is a common submucosal response to trauma from teeth or a dental prosthesis. This inflammatory hyperplasia is the most common oral lesion submitted for biopsy and is found in 1-2% of adults. It is composed of Types 1 and 3 collagen and located most commonly on the lips, buccal mucosa of the cheeks and the lateral portions of the tongue. The fibroma lesions are firm, asymptomatic, and usually have a surface coloration resembling healthy tissue, unless they are ulcerated from repeated trauma. Patients often complain of their appearance if visible (lip) or the frequency of biting them while chewing food. The iPlus laser can remove small fibromas with topical anesthetic only or larger lesions with a few drops of local anesthetic. The benefit in using the laser is reduced bleeding, no sutures, and a much quicker surgery, with very little discomfort postoperatively for the patient. The minimal depth of penetration for the Er,Cr:YSGG wavelength makes this a benefit to the oral pathologist viewing the specimen when it is submitted for histological evaluation as minimal heat artifacts occur when using the iPlus laser for the biopsy.

SUGGESTED SETTINGS FOR FIBROMA REMOVAL

No local anesthetic:
MZ6 tip: 1.5 W, 20 Hz, water 12% , air 10% , H mode.

Local anesthetic:
MZ6 tip: 3.0 W, 40Hz, water 5%, air 10%, H mode.

Hemostasis (where possible):
MZ6 tip: 0.5 W, 50Hz, water Off, air 10%, S mode.

Pre-op | Immediate post-op | Two weeks post-op

Continued on page 24.

4 GINGIVECTOMY + SOFT-TISSUE CROWN LENGTHENING

The most common laser procedure for soft-tissue is the gingivectomy. Removing excess attached and keratinized tissue when there is adequate remaining tissue afterwards is necessary in many disciplines in dentistry. Restoratively, tissue may be preventing visualization of the apical extent of caries or cusp fractures sub-gingivally. Orthodontically, tissue may accumulate interproximally due to closure of diastemas or poor oral hygiene. Medically, certain medications (Dilantin) can cause gingival hyperplasia, and when contemplating esthetic indirect restorations in the anterior segment, minor soft-tissue revisions can make a nice case look great by improving the "pink" component of the smile makeover.

The iPlus laser can be used to recontour soft-tissue quickly, with little hemorrhage and when used with all porcelain restorations, the soft-tissue recontouring is done on the same day as the preparations are completed with no extra time necessary for healing. The ability of the iPlus laser to gently revise soft-tissue on the same day as preparations are completed helps reduce the number of appointments for the overall treatment.

SUGGESTED SETTINGS FOR GINGIVECTOMIES

No local anesthetic:
MZ5 tip: 1.5 W, 20Hz, water 20% , air 20%, H mode.

With Local Anesthetic:
MZ5 tip: 2.1 W, 30 Hz, water 20%, air 20%, H mode.


Pre-op


Intra-op


Two weeks post-op

5 CROWN TROUGHING

Soft-tissue management for indirect restorations is traditionally accomplished with the use of retraction cord to create space for impression materials to capture details of the final margin placement. Although digital methodologies such as the 3Shape Trios are gaining acceptance in the field, reliance on traditional techniques dominate still. With either digital or traditional methods of capturing final margins, there is difficulty in manipulating the tissue when margins are buried sub-gingivally when using retraction cord. Although we would love to keep all margins supra or equi-gingivally, there are times where deep margins in inflamed tissue can be problematic. Lasers can be used as an adjunct to trough around margins and reduce or even eliminate retraction cord. Benefits of lasers include hemostasis, less reliance on hemostatic agents, and great healing. With the all-tissue iPlus laser, we are able to ablate soft-tissue, as well as small amounts of bone that may be "in the way." If left untouched, this bone may cause violation of biologic width resulting in painful, erythematous and unsightly tissue after the final restorations are delivered. Using the iPlus laser can greatly simplify tissue management for all indirect restorations providing laboratory evaluation of the final margins regardless of which methodology of capturing the preparation details is utilized.

SUGGESTED SETTINGS FOR LASER CROWN TROUGHING

No local anesthetic:
MZ5 tip: 1.5 W, 20 Hz, water 12%, air 10%, H mode. (Unless tissue is inflamed, then S mode).

With Local anesthetic:
MZ5 tip: 2.0 W, 50 Hz, water 5%, air 10%, H mode.

Hard-tissue ablation:
MZ5 tip: 4.5 W, 50 Hz, water 90%, air 60%, H mode.


Pre-op


Two weeks post-op

BONUS PROCEDURE 1

ENDODONTIC DISINFECTION

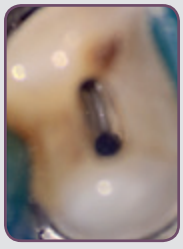
Endodontic treatment is needed when the pulp becomes inflamed or infected. A common denominator to many of these insults to the pulp is that microorganisms play an essential role to the development and continuation of pulpal and periapical diseases. Unfortunately, eliminating bacteria is not simple, and current modalities that include a variety of instrumentation techniques, as well as irrigation and intra-canal medications are not always effective. In addition, chemicals, such as bleach (NaOCl) and calcium hydroxide ($CaOH_2$) have a limited ability to penetrate dentinal tubules to around 130 microns and require direct contact with cells to be bactericidal.

In contrast, lasers have the ability to penetrate deeper into dentin and provide tremendous levels of bacterial reduction without actual direct contact. The iPlus laser, due to its pulsed high-peak power, provides incredible photoacoustic streaming of irritants inside the canal leading to removal of the bacterial smear layer, opening of dentinal tubules, and opening of lateral canals. The iPlus laser with its radially firing tips (RFT2 and 3) specifically designed for the smaller constraints of canals, allow for 85% of the laser energy to be laterally firing rather than end firing and greatly facilitates cleaning of the canals. The laser is used for 60 seconds per canal following traditional rotary file instrumentation and just before obturation. Microscopic examination of the canals shows incredibly clean surfaces after completion of the laser disinfection.

SUGGESTED SETTINGS FOR ENDODONTIC DISINFECTION

Laser Clean and Shape:
RFT2 Tip: 1.25 W, 50Hz, water 10%, air 34% , H Mode.

Laser Disinfection:
RFT2 Tip: 0.75 W, 20Hz, water 1%, air 10%, H Mode.



Pre-op

Post-op

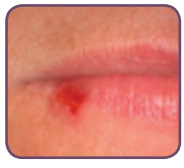
6 LASER TREATMENT FOR ORAL LESIONS

A very common finding today is a patient who presents to the practice with a painful oral lesion that can make dental treatment difficult. Lesions such as recurrent aphthous ulcers, herpetic lesions or denture sore spots can be treated with the iPlus laser. The ability to decrease the discomfort significantly right away is important, but in addition, the lesion has been shown to heal more rapidly because of Low Level Light Therapy effects. Research has shown, that once healed, the lesion has a longer remission period and that reappearance is likely to be delayed or, in some instances, does not occur again in the same area. Patients are appreciative of the concern in treating these lesions, and some will find that the laser is their preferred method of treatment, eliminating the need for topical or systemic medications. The combination of the superficial iPlus wavelength with the deeper penetrating 940 nm diode lasers such as the EPIC or iLase diodes can yield ideal results immediately and in the first few days after treatment.

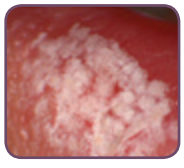
SUGGESTED SETTINGS FOR TREATING ORAL LESIONS

WaterLase iPlus all-tissue laser:
MZ6 tip: 0.25-0.5 W, 50Hz, water 0%, air 20%, H mode.

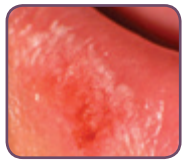
EPIC or iLase diode laser:
0.5-0.8 W CW, uninitiated tip, 2-3 mm defocused.



Pre-op



Intra-op



Immediate post-op

Continued on page 26

REPAIR FOR MANAGEMENT OF PERIODONTITIS

7

Traditional treatment of periodontally involved pockets involves a resective technique of osseous surgery that results in the teeth looking like a “pier at low tide. ” The appearance of longer teeth with healthier pockets is often met with disdain by the patient who finds it much more difficult to clean their teeth, has to deal with increased sensitivity due to exposed roots, and is unhappy with the dark triangles interproximally.

Regenerative techniques to gain improvement in clinical attachment levels have not yielded positive results. The ability to provide pocket reduction with “bottom up” laser induced bone regeneration versus a “top down” healing through elimination of pseudo pockets through resection of tissue creates excitement for many patients. Lasers offer a more minimally-invasive approach without full flap surgery, fewer sutures and less bleeding. The postoperative period is significantly more uneventful, and results for 90% of patients can often lead to a 50% reduction in pockets where the preoperative periodontal pockets were single digits.

The REPAIR protocol can also be used for individual sites or in cases of full mouth periodontitis. It can be used in initial attempts to save ailing implants suffering from early to moderate bone loss, a problem that is increasingly being seen with titanium dental implants.

PERIODONTITIS PROTOCOL

STEP 1: OUTER POCKET DE-EPITHELIALIZATION

STEP 2: GINGIVECTOMY (AS NEEDED)

STEP 3: DE-EPITHELIALIZATION AND RETRACTION

STEP 4: SCALING AND ROOT PLANING

STEP 5: SULCULAR DEBRIDEMENT / DEGRANULATION

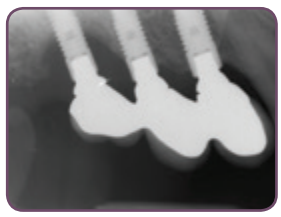
STEP 6: BONE DECORTICATION

STEP 7: FINAL SULCULAR DEBRIDEMENT

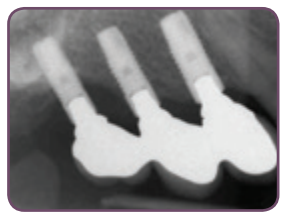
STEP 8: COMPRESS WITH 2X2 GAUZE

Pre-op

Three years post-op



Pre-op



20 months post-op

Download the illustrated REPAIR guide, including complete protocol and suggested settings at:

http://go.biolase.com/perio

REPAIR implant protocol for peri-implantitis is also available.

BONUS PROCEDURE 2

OSSEOUS CROWN LENGTHENING

Clinicians are often faced with the need to reduce small amounts of bone in order to satisfy either esthetic or biologic issues for restorative dentistry. Many times when a patient fractures a cusp subcrestally, we would love to "push" the bone apically by an mm or two to see whether the tooth is restorable and to produce a margin that is above the bone. At other times we see an opportunity to improve the soft-tissue asymmetries in the the smile by sculpting the thin bone on the maxillary incisors. That would allow for establishment of improved "pink" esthetics in combination with the improved "white" esthetics that our porcelain restorations will provide for the patient. The laser can be used in a minimally-invasive approach in these instances to recontour the bone through intrasulcular (closed flap) osseous recontouring. Magnification and attention to detail with technique is necessary but the laser can provide for significantly less postoperative discomfort and reduced healing time. A laser crown lengthening can provide ideal healing in two to three weeks as opposed to triple that time with traditional open flap surgery. The procedure is completed with a gingivectomy which provides soft tissue relief and the re-establishment of biologic width is enabled through hard tissue ablation of the sub gingival bone. This procedure can be combined with small flaps in the posterior to establish biologic width interproximally with only a single suture to close the papilla. The iPlus laser can help significantly in providing an improvement in esthetics and function when used to recontour bone.

SUGGESTED SETTINGS FOR OSSEOUS RECONTOURING

Gingivectomy:
MZ6 tip: 1.5 W, 30Hz, water 40%, air 20%, H mode.

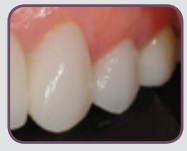
Osseous Recontouring:
MZ6 tip: 2.5 W, 30Hz, water 80%, air 75%, H mode.

Bone Plasty:
MZ6 tip: 2.5 W, 50Hz, water 80%, air 75%, H mode.

Tissue Plasty:
MZ6 tip: 1 W, 75Hz, water 30%, air 30%, H mode.


Pre-op


Immediate post-op


Two weeks post-op

CONCLUSION

The introduction of a new all-tissue WaterLase iPlus 2.0 Er,Cr:YSGG laser can be best accomplished by starting with the dental procedures listed in this article. After mastering these commonly encountered situations the clinician will feel confident in using the laser for restorative, soft-tissue, and hard tissue applications. At times, the laser will make the procedure simpler and at other times the benefits to the practice will be a win for the patient and the practice; providing dental care that previously was not completed at all or was referred out for treatment. Remember to keep lazin'...its amazin'...and learning to walk before we run with laser dentistry will yield a greater chance of successfully integrating the BIOLASE WaterLase iPlus 2.0 laser into your practice.

ABOUT THE AUTHOR

Dr. Glenn A. van As is a practicing dentist in North Vancouver, B.C., Canada who has been using erbium lasers since 1999 and has a masters in laser dentistry from the Academy of Laser Dentistry. He has lectured and published on multiple wavelengths in dentistry worldwide and continues to train and educate dentists on the value of light-based technologies for multiple applications in private practice.

PROVIDING TOMORROW'S DENTISTRY TODAY THE COMFORT AND CONVENIENCE OF LASER DENTISTRY

INSPIRED DENTIST

WCLI member Dr. Jeffery Harrison began his journey as a laser dentist in 1999. Today, in addition to his private practice, he contributes to the Gordon Christensen Mentorship and Spear Education programs at the Scottsdale Center for Dentistry.

MEET DR. JEFFREY HARRISON, he holds WCLI Mastership Certification, one of the WaterLase Core Training faculty members, and the creator of the popular Facebook group page *WaterLase Dentist*.

Dr. Harrison was fortunate to be one of 18 students selected to enter dental school straight from high school in 1988. He simultaneously earned his Bachelors of Arts degree in Biology and a Doctor of Dental Surgery in 1994 from the University of Missouri Kansas City, School of Dentistry.

Q: ***How was it that you became a laser dentist?***

A: In 1998, after completing a General Practice Residency at St. John's Mercy Medical Center in St. Louis, Mo., and working as an associate dentist in a couple of practices, I decided to open a practice. I chose technology as my "niche" to make me stand out from other dentists in my area. Our slogan has always been "Experience Tomorrow's Dentistry Today!" I began using lasers in 1998 for assisting in diagnosis of dental caries. Then in 1999, we began to use lasers to scan teeth preparations for digital imaging and CAD/CAM design and milling.

Q: ***What is your current favorite laser procedure?***

A: The ability to manipulate soft tissue with YSGG is what I enjoy the most. Whether it be improving smile design through sculpting of gingival tissues, or troughing crown and bridge preps to improve final impressions (either digital or traditional). I imagine I paid for my first WaterLase through the addition of one procedure never billed in my practice prior to owning a laser; the frenectomy. Currently, the addition of REP*ai*R with the radial-firing periodontal tip is proving to be a valuable asset not just to my practice's bottom line, but my patients' overall health. We are achieving better results today than when we were just using diode therapy in addition to scaling and root planing.

Q: ***What types of technology do you have in your practice?***

A: I currently have LED technology combined with intraoral cameras for laser assisted diagnosis using SOPROCARE cameras by Acteon. I also have CEREC Bluecam for digital scanning and in-house milling and design and have even sent a few cases digitally to the lab via CEREC Connect.

I have retired two Diolase Plus 810 nm BIOLASE Diodes, and still have one LaserSmile 810 nm diode in operation along with an EPIC X 940 nm Total Diode Solution package. Both are mainly used in hygiene.

In 2013, I retired my WaterLase MD and upgraded to the WaterLase iPlus (I wished I had upgraded sooner).

Q: ***What do you feel are your noteworthy accomplishments as a laser dentist?***

A: Achieving Mastership certification through the WCLI has proved to be a noteworthy accomplishment for me and my practice. My patients benefit through the level of comfort, care, and convenience I am able to provide them through the use of lasers. Mastership has led to an opportunity to become a Core Trainer for BIOLASE resulting in me having a positive impact on other dentists' practices.

Recently, I started a Public Facebook Group called "WaterLase Dentist." I invite anyone who is either interested in using or is using lasers in dentistry to join the group. We have members from all around the world participating in this group. We have had questions posted and answered by experienced laser clinicians, sometimes with differing opinions which is fine because I

think it is important to see there is more than one way to achieve a good clinical result. Case pictures have been posted for showcasing successes, motivational thoughts have been shared, surveys taken, and clinical tips given…all for free.

To me, the feeling of community is important for professional growth. Practicing dentistry, and probably even more so practicing laser dentistry, can often feel like you are stranded alone on an island with no one around to ask a question, or share a success with. Many of us are achieving results using laser technology that most dentists are not even aware can be done.

Q: ***Can you provide us with a few examples of how laser dentistry helps the productivity of your practice?***

A: Laser dentistry can help boost office productivity in many ways. One example is the ability to work on multiple quadrants in a single visit because of a reduced need to administer local anesthetic. This not only saves the patient's time, it cuts the risk of appointment failure and reduces overhead costs for second appointment setup/turnover. The second is "Happy Mom" word-of-mouth. Their child likes coming to the dentist for a filling. Sometimes, this is a simple add-on to your schedule for the day saving the patient another appointment, travel time, time away from school or work, and can be used to fill otherwise unused appointment time. Using lasers to ensure crisp, clean impressions increases productivity because of fewer remakes of crown and bridge restorations and retakes of impressions. I could go on and on about laser use in dentistry, and yet I have only named a few.

Q: ***How long have you been a member of the World Clinical Laser Institute?***

A: I joined the WCLI in 2005 after purchasing my BIOLASE diodes and WaterLase lasers.

Q: ***What is your favorite part of being a member of the WCLI?***

A: My favorite part of being a member of the WCLI is attending the Super Symposium. That meeting has always been filled with top notch speakers, and I always manage to learn something at each and every event even after 10 years. The WCLI meetings are a great source of energy to fill you up for the daily grind of practice. It is also fun to see those who I have helped learn the fundamentals of laser dentistry advance into Fellowship and Mastership status within the WCLI at the Super Symposium. To top it all off, that meeting is always a fun social gathering with friends in the laser community.

Q: ***What are your hobbies and interests outside of dentistry?***

A: Living in Colorado to me is all about being outdoors and taking advantage of the beautiful scenery. When not practicing laser dentistry, you will find me riding a mountain bike, hiking a 14,000 foot peak, snow skiing, Jeeping, or riding snowmobiles and ATVs with my wife, Teresa, and daughters, Siera and Kenna.

Photography: Cathy's Creations

PAMPERING THROUGH TECHNOLOGY
THE PATHWAY TO PATIENT TRUST

A PASSION IN LASER DENTISTRY
Dr. Andri Suwardi prides himself in offering his patients a memorable experience rather than an ordinary dental appointment.

MEET DR. ANDRI SUWARDI who is changing the face of dentistry in Jakarta, Indonesia.

When walking into Dr. Suwardi's office, you might be reminded of a fancy night club rather than a typical dental clinic. Experience a game room, relaxation room with music and exotic aromatherapy, plus an interactive dynamic screen for patient education, all with a breathtaking view of Jakarta.

Dr. Suwardi brought the philosophy of premium dentistry to Indonesia, with the focus on providing patients a dental experience that is fast, painless and absolutely first class. Beyond a luxurious office, Dr. Suwardi uses a full complement of technology – from WaterLase and in-office milling to 3D x-ray to help patients overcome their fear of dentistry.

But most importantly, he has a passion to ensure the highest caliber of patient care. This passion led him to WaterLase dentistry as a key component of providing the best service to his patients with minimal pain and a minimally-invasive philosophy. A WCLI member since 2012, Dr. Suwardi uses his WaterLase on soft tissue, hard tissue, endo, perio… there isn't a day that goes by that it isn't firing to bring the best and most comfortable treatment to his patients.

Q: ***How many years have you practiced dentistry?***

A: I have been practicing dentistry for 25 years since 1990. Many people still believe that a visit to the dentist is very intimidating and cumbersome. These perceptions inspired my practice and philosopy: Neu Premium Dentistry, to open our door and introduce the first premium dentistry concept in Jakarta, Indonesia. With the premium dentistry concept, Neu provides fast and painless first-class dental treatments to our patients.

Q: ***How was it that you became a laser dentist?***

A: In 2006, I was introduced to WaterLase (laser technology in dentistry by BIOLASE). After seeing how it could be applied towards a variety of applications within the field of dentisty, I purchased the WaterLase laser and have been using it in my clinic ever since. The initial cost was quite hefty, however it was worth it. Having a laser in my practice allows me to work more conservatively and also saves me a lot of time.

Q: ***What is your current favorite laser procedure?***

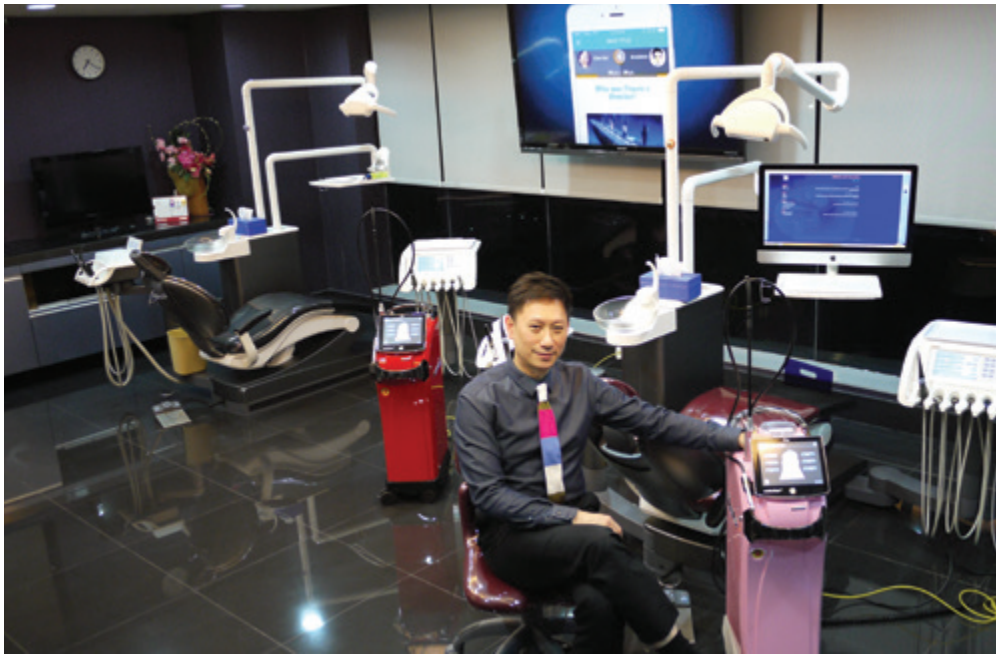
A: I don't think I would be able to choose just one in particular. Soft tissue incision, gingival contouring, and disinfection of root canal, just to name a few. I also enjoy using the EPIC diode pain therapy laser to treat paraesthesia. To be able to help patients to regain their sensory abilities and be able to feel normal again is simply priceless.

Q: ***What types of technology do you have in your practice?***

A: I have both the WaterLase iPlus all-tissue laser and EPIC 10 diode laser. In my day-to-day practice, I mostly use the WaterLase. However, I also use the EPIC for teeth whitening and pain therapy.

Q: ***What do you feel are your noteworthy accomplishments as a laser dentist?***

A: In my practice 'Neu Premium Dentistry,' we pride ourselves on delivering gentle and painless dental treatment. Being a laser



dentist, the surgical procedures that traditionally could result in a lot of bleeding and longer healing times is no longer an issue. Having a laser in my practice allows me to work more conservatively and cleanly. I am able to offer my patients comfort and peace of mind.

Q: ***How does laser technology help the productivity of your practice?***

A: Recently I was able to remove a veneer in just under a minute. This would have not been possible in the past using burs, hence shorter chair time for patients. Another example would be mainipulating soft tissue prior to crown placement, and using the laser to stop bleeding instantaneously. I also use the laser to disinfect root canals, and the success rate of my root canal treatments are higher compared to my pre-laser practice.

Q: ***What is your favorite part of being a member of the WCLI?***

A: Being able to gain information and knowledge directly from laser experts around the world regarding the latest research and protocols of laser application in dentistry. Also it is great to be able to discuss laser procedures with like-minded dentists.

Q: ***What are your hobbies and interests outside of dentistry?***

A: In my free time I like to play tennis. I also enjoy travelling with my family. Of course, I update myself with journals and the internet for the new techniques and technology. I believe we can improve and update ourselves by learning from developments in dentistry.

HOW A NEW LASER WAVELENGTH SHIFTED THE DENTAL LASER PARADIGM

AN ENDODONTIC HANDPIECE COMPANY MADE A BET on a novel dental laser wavelength, much to the benefit of dentists and patients worldwide.

The early 1990s were an important time period in the evolution of lasers in dentistry. Prior to this, dental lasers were primarily used for soft tissue surgical applications. Common lasers included carbon dioxide (CO_2), Argon, and Nd:YAG lasers, which were limited primarily to specialists. A new wavelength was emerging, however, for dentists seeking a laser alternative to the dreaded dental drill, needle and scalpel.

This new wavelength, based on an erbium/chromium crystal doped with yttrium, scandium, gallium and garnet (Er,Cr:YSGG), showed great promise for ablating oral hard tissues – enamel, dentin, and bone – without anesthetic or a drill in most cases.

At this same time, a small company in California named Biolase Technology, Inc., founded by well-known endodontist Dr. Guy Levy, envisioned using lasers and water together in dentistry to cut teeth painlessly without the need for injections or a high speed drill. The company immediately began researching the full benefits of the YSGG wavelength in dentistry.

Within a year, the first studies about the Er,Cr:YSGG wavelength appeared in the literature. Rizoiu, et al., first reported in 1996 in BiOS, the Journal for the International Society for Optics and Photonics, that the YSGG laser was safe to use and concluded the laser "may be safely employed for tooth preparations without causing adverse pulpal effects." Later, researchers further tested pulpal response to positive results. Eversole, et al., concluded in a 1997 issue of JADA that "No pulpal inflammatory responses could be identified either immediately or 30 days post-operatively." In 1999, Matsumoto, et al., reported in a widely cited clinical study that the YSGG wavelength was "an efficient, effective and safe device for caries removal and cavity preparation in clinic." Furthermore, Matsumoto reported "patient acceptance rate was excellent, and there were no adverse effects."

By 1998, the company began selling a device known as the "Millennium" laser. In 1999, the company released an improved version known as "Millennium II," which was eventually re-branded as WaterLase in 2000. After it's rebranding, the WaterLase became the first true blockbuster product for cutting hard tissue with lasers, and by 2002, more than 1,000 dentists around the world were using the YSGG laser in clinic. By the fall of 2004, the number of WaterLase dentists had increased to more than 3,000. Today, nearly 10,000 dentists around the world use the YSGG wavelength in their daily dentistry, offering minimally-invasive, atraumatic, YSGG laser dentistry for the benefit of patients.

[1]Rizoiu I, Kimmel AL, Eversole LR. "Effects of an Er, Cr: YSGG laser on canine oral hard tissues." In BiOS Europe'96, pp. 74-83. International Society for Optics and Photonics, 1996.

[2]Eversole, L. R., and I. Rizoiu. "Pulpal response to cavity preparation by an erbium, chromium: YSGG laser-powered hydrokinetic system." The Journal of the American Dental Association 128, no. 8 (1997): 1099-1106.

[3] Hossain M, Nakamura Y, et al. "Effects of Er, Cr: YSGG laser irradiation in human enamel and dentin: ablation and morphological studies." Journal of clinical laser medicine & surgery 17, no. 4 (1999): 155-159.

AN EARLY ADOPTER OF MANY DENTAL TECHNOLOGIES

Founding WCLI member Dr. Robert Miller poses with the first-ever Er,Cr:YSGG laser in the U.S.

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