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A PUBLICATION OF THE WORLD CLINICAL LASER INSTITUTE

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EDITORIAL

MENTORSHIP 101: THE LASER JOURNEY

As we get older and pursue various career paths, we all pass through similar stages. Fresh out of college, we focus on skill acquisition. At the peak of our career, we accumulate financial wealth the fastest and develop our most meaningful friendships. Finally, we are ready to slow down and plan for retirement, think about our health, so we can enjoy the fruits of our labors with family and friends. This is where the value of mentorship is frequently overlooked and what I would like to discuss in this editorial.

In 2026, I will be celebrating 20 years in laser dentistry. My beginnings were a little bit like reinventing the wheel: you hear a lot of advice from different people, then you try it yourself...sometimes it would work and sometimes it would not. Without knowing valid scientific foundations of the technology, it is hard to know where you went wrong. I wish I had a mentor to guide me through my early years. For the mentored this relationship could bring:

1. **Access to experience and wisdom**, shortcuts to learning by sharing lessons from someone else's successes and failures.
2. **Guidance and support**, helping to make the right decisions, handle challenges and build confidence.
3. **Network expansion**, introducing you to the community of like-minded professionals facing same challenges, developing same skill set.
4. **Encouragement and accountability**, staying in touch with your mentor helps the beginner to know that someone already navigated similar situations and came out victorious.
5. **Identity and purpose**, seeing where your mentor is at the sunset of their career can help you evaluate your own path and where you want to be.

Mentorship is a reciprocal relationship that offers a deeply meaningful value to both the mentor and the mentored. When you eventually become an expert in the field that you are passionate about, and passion inevitably breeds expertise, you become a mentor without even consciously wanting to do it, it just happens.

This is what being a mentor has brought into my life and into the tail end of my clinical career:

1. **Legacy and impact**, it is a way to pass your hard-earned wisdom and knowledge, to influence the next generation of dentists, promote the technology and patient care way past your own personal career span.
2. **Reflection and renewal**, teaching others often makes you pause and think and re-evaluate how you practice, modify and further improve what is already well done.
3. **Leadership development**, teaching improves your ability to communicate, listen, coach, speak in public, a very important leadership quality.
4. **Staying current**. Younger dentists are bringing fresh perspectives, new research and insights from their own fields of expertise: microscopes, PRF, digital workflow. This keeps the mentor in touch with the new and evolving technologies.
5. **Personal fulfillment**. There is a definite emotional reward seeing someone grow and succeed with your help.

We are all finite: we are born, we live, work and eventually, die. But if you pass on your knowledge, through mentoring, your influence will live forever. Energy is neither created nor destroyed, it just changes form. So, let's pass our energy, our laser light forward, so that it never disappears. ■



DR. MARINA POLONSKY
EDITOR

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**JOURNAL OF
LASER-ASSISTED DENTISTRY**
A PUBLICATION OF
THE WORLD CLINICAL
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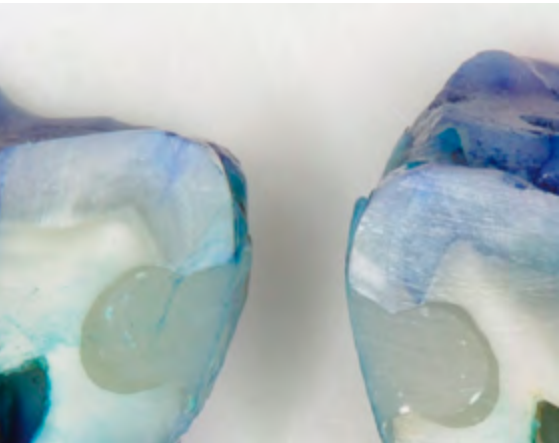
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DENTIN SURFACE MODIFICATION WITH ER,Cr:YSGG LASER

Original Research

By Yuliya Kozlova, DDS, MSc, PhD



INTRODUCTION

According to the World Health Organization, caries remains the most common oral disease. Nowadays, a long-term functionality of the restoration and an optimal adhesion of the filling material to dental hard tissues is still a major challenge.¹ Microleakage between the restorative material and the tooth structure is a significant problem in operative dentistry and can lead to secondary caries, pulpal injuries, post-operative tooth hypersensitivity, marginal discoloration, and fracture of the restorations.²⁻⁵ A lot of manufacturers of dental adhesives are working on research and development of formulas, components, additives, such as quaternary ammonium monomer for antibacterial effect⁶ or graphene-based dental adhesive with anti-biofilm activity.⁷ Also new generations of adhesive systems appear, now we have self-etch (6th, 7th and 8th generation) systems.⁸

AIM

To compare the microleakage between the dentin surface and bonding with different generations of adhesive systems after etching the dentin with the orthophosphoric acid and Er,Cr:YSGG laser.

MATERIALS AND METHODS

Forty (40) third molars, extracted for orthodontic reasons, were distributed into two groups. Two V class cavities on buccal and lingual surfaces of each tooth were prepared with diamond round burs. (Table 1)

1ST GROUP

For the 1st group the etching was done with orthophosphoric acid 37.5% Gel Etchant (Kerr, Brea, CA, USA). The dentin etching techniques included total etching (15s) for the V generation.



Figure 1: Orthophosphoric acid 37.5% Gel Etchant (Kerr, USA)

Orthophosphoric Acid Etching		Laser Surface Modification	
1st group		2nd group	
1	1A	2	2A
10	10	10	10
Non-thermocycling	Thermocycling	Non-thermocycling	Thermocycling

Table 1: Samples distribution into different groups

2ND GROUP

For dentin surface modification Er,Cr:YSSG laser (Waterlase iPlus®, Biolase®), wavelength 2780 nm (Fig. 2), was used with the following parameters:

Average Power = 4.5W (90 mJ/pulse), pulse repetition rate of 50 Hz (50 pulses per second), pulse duration of 60 μ s (H-mode), 90% Water, 80% Air, “Gold Handpiece”, MZ6 tip (600 μ m in diameter) E.D.= 16.07J/cm², scanning movements for 30 seconds at 1mm away from the dentin with a 40-60° angle. (Fig. 2)



Figure 2: Er,Cr:YSSG 2780nm dental laser (Biolase, USA)

Bond Universal (3M, USA). – according to manufacturer's instructions - after cleaning and drying surface of dentin/enamel applying one layer of adhesive and air dry, light cure for 10s.

MICROLEAKAGE ASSESSMENT

Determination of microleakage of restorations with and without thermocycling with subsequent dye penetration

- 2 % solution of methylene blue.
- The specimens from groups 1, 2 were stored in distilled water at 37 °C for 24 h and then moved for dye penetration stage of research.
- The specimens from groups 1A, 2A were stored in distilled water at 37 °C for 24 h and then moved for thermocycling.

After dye penetration, the teeth were cut (Microtome machine T210, France) in the sagittal plane and a comparative analysis of the depth of penetration of the dye into the space between the restoration and the tooth wall was carried out. All tooth samples were photographed at 20× magnification. (Fig. 3)

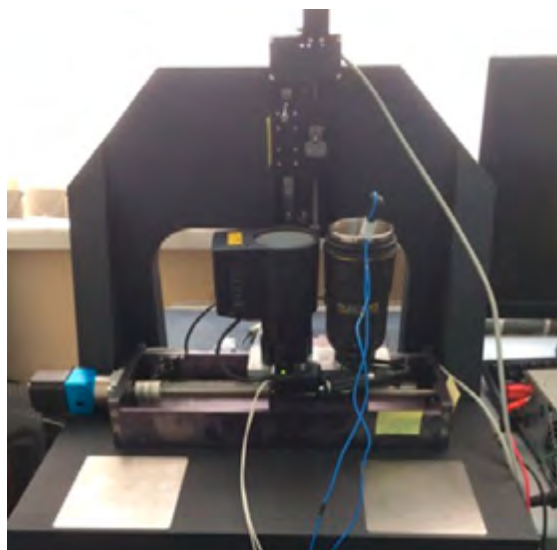


Figure 3: Microtome Machine T210, France

LABORATORY RESEARCH METHODS

For photo with methylene blue (dye penetration) microleakage assessment done by following criteria:

- 0 points** - no dye penetration;
- 1 point** - dye penetration of the enamel wall of the cavity;
- 3 points** - dye penetration of the enamel and dentin walls and the floor of the cavity under the restoration.

THERMOCYCLING

To carry out the thermocycling method, was used method and a device for thermocycling (Patent №2725077, Russia). (Fig. 4)



Figure 4: Thermocycling Set up

SEM

SEM was examined under a microscope LEO-1430 VP (Carl Zeiss, Germany) with the use of a back-reflected electron detector 4 QBSD. All photos were taken at 4000× magnification. The samples were glued to aluminum plates, sputtered with platinum by cathode sputtering in an argon atmosphere, and viewed in a high vacuum mode. The specimens studied on SEM were not included in the statistical analysis process. (Fig. 5)

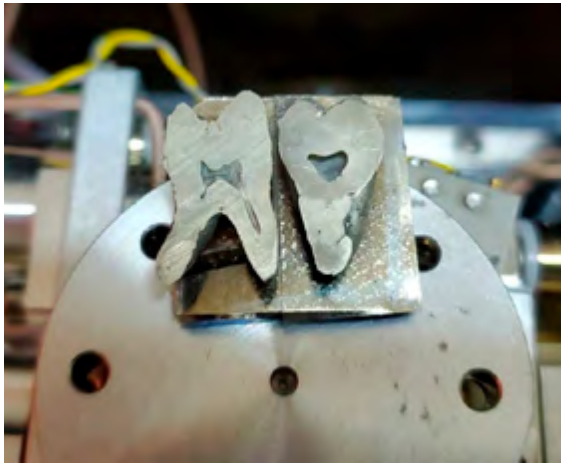


Figure 5: Samples of specimens prepared for SEM examination.

STATISTICAL ANALYSIS

The median is a measure of the central tendency of the distributions of quantitative features regardless of the distribution law and is equal to the value of the feature that halves the distribution of the observed values over the range of values. The quartile segment contains the central 50% of the trait values and is used together with the median (50th percentile) to describe data with a distribution other than normal 1,2 in the form Me (nq; vq), where Me is the median; nq is the lower quartile, vq is the upper quartile.

Comparison of two independent groups for each quantitative trait was carried out using the nonparametric Mann-Whitney

test, which can be used in cases of a small amount of data in the groups. The values of the signs in the groups were compared at the stages of observation.

The results obtained were interpreted as follows:

- if the calculated value satisfies the condition $p > 0.05$, then the null hypothesis of the absence of differences between the groups according to the studied attribute was not rejected;
- if the calculated value satisfies the condition $p < 0.05$, then the null hypothesis was rejected and an alternative hypothesis was accepted about the existence of differences between groups according to the studied trait.
- As a result, in different situations, either a null or an alternative hypothesis was accepted for various indicators.
- For a comparative assessment of the results of treatment in each of the groups, the paired Wilcoxon test for related samples was used.

RESULTS

No microleakage was detected in the samples prepared without thermocycling after etching the dentin with orthophosphoric acid (Group 1) and Er,Cr:YSGG laser surface modification technique (Group 2). (Fig. 6)

In groups 1 A, 2A 100% of restorations recorded dye penetration along the entire perimeter.

CONCLUSION

Er,Cr:YSGG laser could be used for dentin surface modification since the results showed no statistically significant difference as compared to orthophosphoric acid etching. ■

GROUP	ORTHOPHOSOPIC ACID		ER,Cr:YSGG LASER	
	Median without thermocycling	Median with thermocycling	Median without thermocycling	Median with thermocycling
5TH GENERATION ADHESIVE SYSTEM	0,0 (0,0)	2,0 (1,3)*	0,0 (0,0)	2,0 (2,3)*

Table 2: Results without and with thermocycling for Orthophosphoric acid (1st group) and Er,Cr:YSGG laser etching (2nd group)

* Marked statistically significant differences between the data without and with thermocycling within each group (without and with thermocycling for orthophosphoric acid group, without and with thermocycling for laser etching group) at $p \leq 0.05$

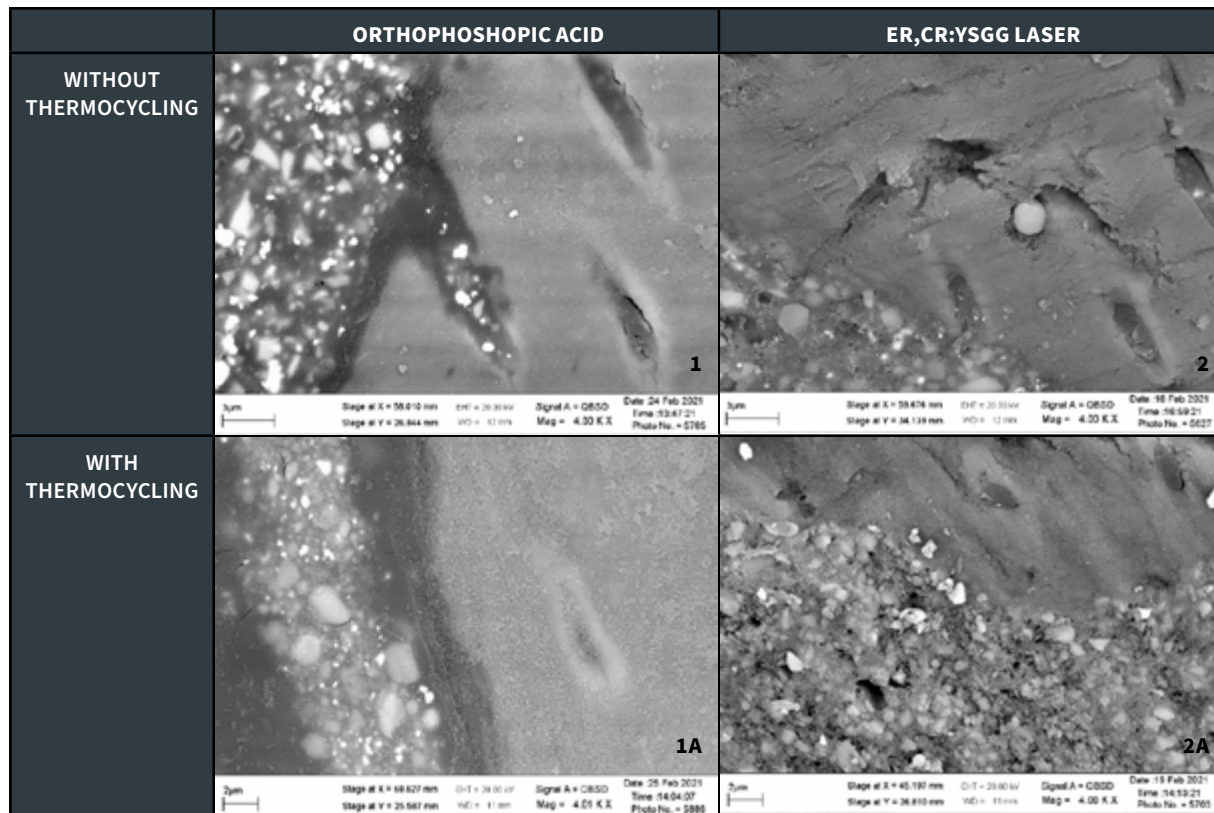


Figure 6: SEM of samples using orthophosphoric acid (group 1 and 1A) and Er,Cr:YSGG laser etching technique (group 2 and 2A) without and with thermocycling. Border «filling -- tooth» (4000x). Significant statistical differences were observed inside groups with and without thermocycling ($p \leq 0,05$).

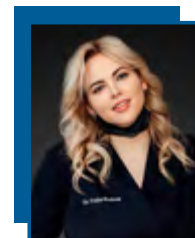
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THE PIVOTAL ROLE OF LASERS IN THE MANAGEMENT OF EXTERNAL ROOT RESORPTION

A Case Report

Lan Tran, BDS, Qldl

INTRODUCTION

In the deciduous dentition, the resorption of roots is a naturally occurring phenomenon and integral to normal development of not only the dentition, but also the dental arch. However, in the permanent dentition, root resorption is considered pathological and presents a cascade of dental repercussions when it leads to loss of the tooth. Root resorption occurs when odontoclasts and often osteoclasts invade the hard tissues – dentine, cementum and bone.

Whilst the exact aetiology is unknown, root resorption is thought to occur secondary to a traumatic event or associated with invasive endodontic procedures, eg traditional root canal therapy. Root resorption can be classified into three types, internal resorption, external resorption and inflammatory resorption.^{1,2}

- **Internal resorption:** this type of resorption appears in internal surface of the root canal system – either the pulp chamber or the root portion. The inflammatory process involves the loss of dentine and potentially the cementum in advanced cases. It appears to develop secondary to extended chronic pulpal inflammation.
- **External resorption:** this type of resorption is initiated within the periodontal tissues. This initially affects the dentine and cementum of the tooth but can invade into the pulp in advanced stages. These can also be further defined as
 - **Replacement resorption** – a pathological loss of cementum, dentine and periodontal ligament with the subsequent replacement of these structures with bone. This disease process results in ankylosis, fusion of the bone and tooth
 - **Surface resorption** – this causes discrete superficial defects in the cementum and underlying dentine. Repair is achieved by deposition of new cementum
 - **Cervical resorption** – this appears in the coronal third of the tooth, generally at the enamel cementum junction
 - **Transient resorption** – occurs as a response to a tooth luxation. Characterised by radiographic apical bone defect and root resorption. Generally resolves spontaneously without interventive treatment
- **Inflammatory resorption:** internal or external pathological loss of tooth structure and potentially bone along the root surface. Usually occurs as a result of microbial infiltration and infection.

The following case was identified as Cervical External resorption. This is typically a unique form which is progressive and aggressive in nature. It generally leads to the loss of the tooth.¹ Damage or loss of the protective predentine and/or precementum appears to initiate proinflammatory cytokines which prompt migration of osteoclasts to the site of injury or inflammation.^{3,4}

Clinically, a single-resorption lesion is found in the cervical area, directly below the epithelial attachment, in the area of the cementum with invasion of bacteria and plaque due to the cavitation and surface roughness. This type of resorption is penetrating and aggressively undermines the root dentine. Rapid progression of the resorptive process appears to be due to a local lack of oxygen. The pathophysiology appears to be localised ischaemia which activates osteoclasts whilst inhibiting osteoblastic activity.⁵

Root dentine and cementum and coronal enamel are often invaded. The predentine (70-300µm) protects the pulp which therefore does not undergo damage for quite some time. Therefore, these teeth are generally asymptomatic despite having quite invasive lesions. As a response to the invasive insult, the pulp retreats and Intrapulpal mineralisation in the form of pulp stones and denticles are often formed. In addition to this, as the lesions advances there appears to be an ingrowth of bone-like hard tissue. This is understood to be part of a repair mechanism.⁵

Patients are generally asymptomatic and, in this authors experience, cervical resorption lesions have been found incidentally as part of routine examinations. They are often noted as an irregularity in the gingival contours, only sometimes associated with gingival inflammation when the lesion has progressed to the point of significant tooth loss resulting in a defect which allows plaque accumulation. This is often in advanced stages as there is often some replacement of the defect with bone-like hard tissue.

In the author's experience, historically it was considered specialist referral was accepted to confirm the diagnosis. Once confirmed, the course of action recommended by the specialist was generally to extract the affected tooth. As the teeth involved ranged from molars to anterior teeth, which affected not only mastication but aesthetics the author sought alternative treatments for patients. It has now been the view of governing bodies that we seek alternative treatments which actively encourage regeneration of the dentally related tissues.^{6,7,8}

CONSIDERATIONS IN MANAGEMENT OF EXTERNAL CERVICAL RESORPTION

Our current strategies for treatment should include

- Management and removal of the invading granulomatous tissue from the tooth and the surrounding periodontium
- Management and removal of the bone-like ingressing hard tissue which has invaded the dentine
- Debridement of the resorption lesion in the tooth and alveolar bone immediately adjacent to the lesion. The aim is to debride the area of osteoclasts and odontoclasts
- If possible, preservation of pulpal tissue. Generally the teeth present asymptotically with normal sensibility testing results, even though advanced lesions may be in close proximity to the pulp. Therefore, management will include some form of Vital Pulp Therapy (VPT)
- Minimising inflammation as the inflammatory cascade of events may lead to failure of the treatment

Current recommendations for treatment of Cervical resorption lesions.⁹

- Trichloroacetic acid (TCA) is used to chemically dissolve the granulomatous tissue whilst preserving dentine. This is applied with a small cotton pellet to the lacuna. Care must be taken to avoid contact with skin or oral mucosa. Sodium Hypochlorite may be used as an alternative. Note, these are considered very cytotoxic.

MODERN PROTOCOLS

Dentine is the protective barrier for the pulp against external noxious stimuli, so it's preservation is ideal.^{10,11} Minimally invasive procedures which encourage regeneration are the goal of clinical management are now recommended.

- Maintain pulp vitality - induce healing/regeneration of pulpal tissue; partly achieved by reducing inflammation of pulpal tissue
- Minimise removal of tooth structure —achieved by promoting remineralisation of affected demineralised dentine

- Eliminate bacteria – this can be achieved with bioceramics due to their high pH & can also be achieved by sequestration of bacteria during crystal formation, or with lasers.
- Platelet Rich Plasma and Stem Cell therapy as osteoblasts in the pulp chamber are often destroyed by bacteria or over-instrumentation

RATIONALE FOR LASER IMPLEMENTATION IN VITAL PULP THERAPY

- No smear layer which means the Bioceramic (AAE recommended medicament) has direct contact with dentine and pulp tissue thereby maximizing the effect of the material and increasing the success of the treatment. Traditional rotary instruments leave a smear layer which limits success of VPT as therapeutic agents cannot interact with the underlying tissue and can impede adhesion of the material to the tooth structure. Lasers also leave more open dentine tubules compared to chemical surface treatment which will enhance bonding and chemical interaction with the underlying tooth structure.^{12, 13, 14}
- Minimise vibrations associated with traditional handpieces – with a tooth which has compromised tooth structure and where the remaining tooth structure is inherently weakened immediately after intervention, we can limit risk of root fracture immediately.¹⁵
- Reduce or alleviate the risk of bacterial ingress into the remaining dentinal tubules usually associated with traditional handpieces whether that be via contaminated water lines or the physical act of rotary handpieces whereby the dentinal mud created has a high bacterial load which is then pushed into the remaining tooth structure.^{16,17}
- Reduce the risk of pulpal damage associated with heat created by traditional handpieces – heat and pressure.^{18,19} Limiting pressure to the already compromised tooth in aims to prevent progression of the resorption lesion
- Selective/preferential removal of diseased dentine over sound dentine with limited side effects to the pulp.¹⁹
- Analgesic effects and reduced post-operative pain.²⁰
- PBM effects of Diodes and pseudo PBM effects of Er,Cr:YSGG - PBM has been shown to activate the stem cells found inside the pulp chamber.^{21,22}

Promote increased microvascular flow to negate the localised ischaemia. Reduction in inflammation which appears to drive the resorptive process.

- Antibacterial effects which, as previously mentioned, can limit the damage to osteoblasts and encourage regeneration of the pulp.²³ Removal of bacterial biofilm to decontaminate the hard or soft tissue is effectively achieved with lasers

CASE STUDY

At the time of treatment, the patient was a 56 year old Caucasian female who presented for a routine examination. She had been in the practice for 16 years and is very diligent with examinations 1-2 times per year. She has no general medical health concerns and had no presenting complaints. This lesion was an incidental finding during her regular recall examination as was noted as an irregularity in the buccal gingival contour of her upper right lateral incisor (#12)(Fig. 1) – iTero imaging. Note the mild swelling with no associated signs of inflammation, comparative to the contralateral tooth.



Figure 1



Figure 2

Though there is evidence that external root resorption is related to pressure damage, in this case there appears to be no history of orthodontic treatment. The patient advises the crowding in the anterior area appears to have become more pronounced over the years and that she does sometimes feel this tooth has been subject to masticatory forces nocturnally. She has a history of Temporomandibular Dysfunction which becomes symptomatic at times, more pronounced on her right hand side.

When the irregularity was mechanically inspected, there was a defect present at the gingival margin of the tooth. (Fig. 2)

Radiographic investigation found the following. (Fig 3,4,5) A well-defined radiolucency intimately associated with the pulp. No periapical pathology/radiolucency was noted.



Figure 3

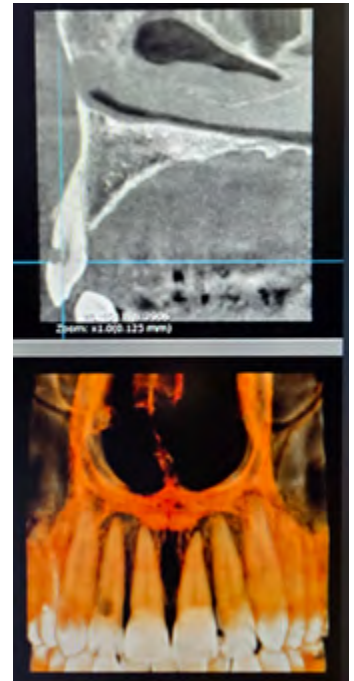


Figure 4



Figure 5

It can be noted that the lesion appears quite advance. The lack of symptoms can be attributed to the predentine protecting the pulp. Therefore, all efforts must be made not to damage this structure, either mechanically or thermally, as this could trigger further resorption and negatively affect the pulp. It was decided to approach this case with the removal of damaged and invaded structures whilst minimising trauma to the remaining structures and pulp. The Er,Cr:YSGG 2780nm was deemed to be the appropriate instrument to perform the removal of diseased hard and soft tissues due to the ability to vary the pulse and wavelength to cope with the varied tissues involved, both soft and hard

tissue with limited collateral damage of healthy tissue. A gingivectomy was first performed so that the entire lesion could be inspected (Fig. 6). This was achieved with the Gold Handpiece and a MZ6 tip, H mode, 1.5W, 30 Hz, Air/Water 20/30. The same tip was then used to remove the granulomatous invading soft



Figure 6



Figure 7



Figure 8

tissue (Fig. 7), in the lesion with the same settings except at 25Hz as the tissue was more fibrous. The bone-like invading hard tissue (Fig. 8), was treated with the Gold Handpiece MZ6 tip, H mode, 20Hz, Air/Water 80/50. At the surface 4W of power was used, however, when the lesion deepened, 3.5W was used to

limit the risk of pulpal exposure. Some alveolar bone reduction was also performed, though this was primarily to ensure removal of osteoclasts, so this was very minimal and performed with the Gold Handpiece, MZ6 tip, 2.5W, 25Hz, Air/water 70/80, H Mode. The Epic Pro 940nm Diode laser is employed after preparation of the cavity due to its antibacterial properties and for PBM.

As the restoration would be in a visible area, it was decided to use BiodentineR (Septodont) as an indirect pulp cap due to this material having the quickest setting time amongst the bioceramics, whilst having the highest concentration of Tricalcium Silicate and no impurities or radio-opaques which would cause tooth discolouration (Fig. 9). Genial FlowR (GC) was placed over the BiodentineR (Septodont) as it requires no force to place, is highly aesthetic, and in this author's experience, maintains a highly polished surface to discourage bacterial colonisation.

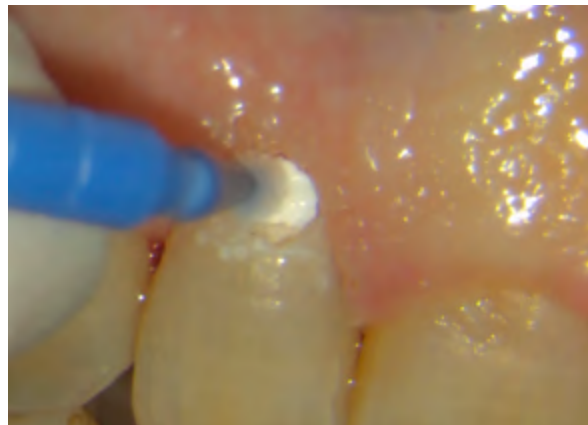


Figure 9



Figure 10

Once the treatment of the 12 was complete, a gingivectomy was also performed using the Er:Cr:YSGG laser on the 11 & 21 (central incisors) to level out the gingival contours for a more aesthetically balanced profile as the patient was a high aesthetic risk. A Gold Handpiece, MZ6 tip, 1.5W, 30Hz, Air/water 20/30, H Mode were used in this procedure. The 1 week post operative photograph shows a good aesthetic outcome (Fig. 10).

At this 1 week follow-up, the patient noted no discomfort and the tooth responded normally to sensibility testing. At the 6

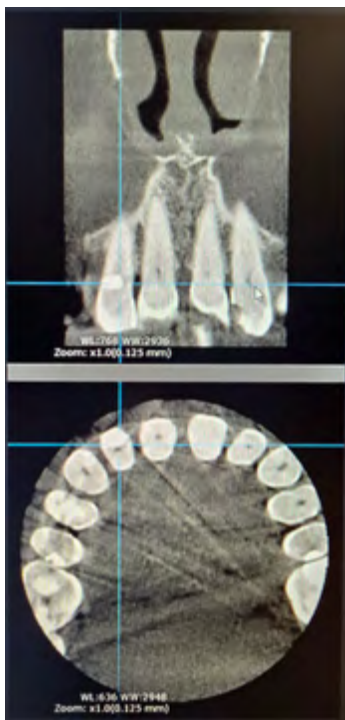


Figure 11



Figure 12



Figure 13

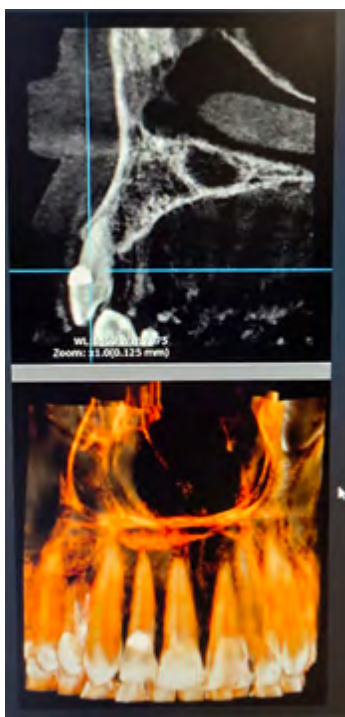


Figure 14



Figure 15

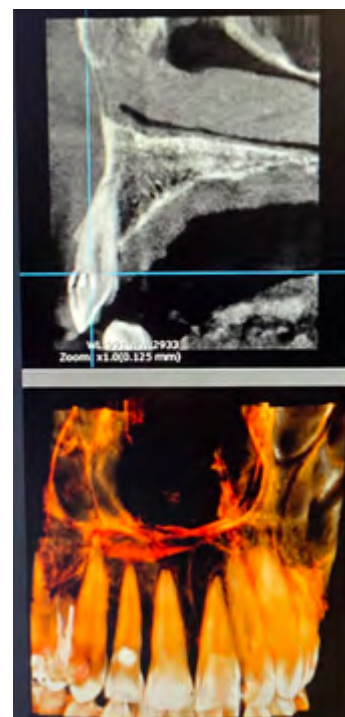


Figure 16



Figure 17

month follow-up the tooth continued to remain vital and asymptomatic. Radiographic images are below (Fig. 11,12). These also show a lack of radiolucent periapical lesions which would suggest that there is no pathology present.

The patient was reviewed again at 12 months post-operative, again with normal pulpal responses and no discomfort. The images are below (Fig. 13,14). Again, no radiolucent lesions are present.

The latest follow up was 2 years post-operative. The tooth remains vital and the patient is still asymptomatic. The radiographs are below (Fig. 15,16) with a continued lack of periapical radiolucency.

Aesthetically, the restoration is also performing well – iTero imaging (Fig. 17). The patient has declined crown lengthening on the 11 to improve the gingival countours.

DISCUSSION

Due to medical advances, the average life expectancy is ever increasing. The same medical advances are also ensuring that life is more physically and cognitively rewarding. Being that nutrition plays a pivotal role in how well our bodies can support these activities, in stands to reason that as dentist we ensure that our patients have the dentition required to support these nutritional requirements. Also, we cannot deny the psycho-social aspects. Reports²⁴ indicate that one of the biggest factors in longevity is the human connections we have. Individuals with poor dental aesthetics often find themselves self-conscious about interacting with others and possibly even withdrawing. As dentists we can support patients in both these vital parts of their physical and mental health.

The aim is to use a procedure which is not only minimally invasive, but has predictable, long-term success. Vital Pulp Management has been shown not only to be predictable but highly successful.²⁵

Lasers exhibit the ability to facilitate osteoblastic driven regeneration which is pivotal to regenerating hard and soft tissue as well as maximising healing. Lasers also promote angiogenesis and regenerating the innervation which is pivotal to success.

Couple the cellular requirements with the mechanical requirements, our technique needs to not only satisfy minimal

intervention but also stimulate regeneration of the dental structures. The combination of a high-grade Bioceramic and lesion management protocol utilising lasers, followed by supportive laser photobiomodulation will enhance the success and aim to ensure predictable results whilst minimising patient post-operative complications.

Maintenance of vital teeth within the dentition aids in mastication and supports the body's nutritional needs. Additionally, the maintenance of an attractive functional dentition improves the patient's aesthetics which are integral in aiding integration into social situations and improving social outcomes. ■

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DIAGNOSIS AND MANAGEMENT OF CEMENTAL TEARS

By Julie Brann, DMD, Yiwen Toni Chen, DMD, Stephen P. Niemczyk, DMD, Bruno Azevedo, DDS, Frederic Barnett, DMD

ABSTRACT

Cemental tears, a rare but significant clinical condition, involves the detachment of cementum from the root surface, often leading to clinical challenges such as deep periodontal probing defects, abscess formation, and localized pain. Clinical diagnosis is confirmed using cone-beam computed tomography (CBCT), which reveals the delamination of a cementum fragment. Treatment options vary depending on the location and severity of the tear; the most common of these being the surgical removal of the cementum fragment, resulting in loss of alveolar bone. This case report describes the management of a 61-year-old male with a cemental tear in a maxillary lateral incisor. Apical root end surgery, along with removal of the cemental fragment was performed utilizing the Waterlase iPlus Er,Cr:YSGG laser (Biolase). The laser was employed for root end resection, removal/ablation of the granulation tissue, and for root surface decontamination. At the one-year post-operative visit, there was favorable soft and hard tissue healing with complete resolution of symptoms. This case highlights the effectiveness of surgical management utilizing the dental laser in the treatment of cemental tears, emphasizing the need for further research in developing standardized treatment protocols that promote optimal outcomes and preserve natural teeth.

INTRODUCTION

Cemental tears, characterized by the partial or complete detachment of cementum from the root surface, are a rare but clinically significant dental condition.¹⁻⁶ These tears are observed most in incisor teeth, particularly when subjected to occlusal dysfunction and trauma, with male patients over the age of 60 being most frequently affected.^{1,2,3,6} Clinicians often encounter several clinical findings associated with cemental tears, including localized abscess formation, pulpal involvement, significant tooth wear, and deep periodontal probing defects.^{1-4,6} Accurate diagnosis typically requires advanced imaging techniques, such as high-resolution, small field of view (FOV), cone-beam computed tomography (CBCT), which can reveal early cementum delamination in the axial slices.^{1,5} Despite these diagnostic advancements, the lack of standardized treatment protocols present challenges, leading to unnecessary tooth extractions in cases where the teeth could otherwise be preserved. The primary goal of cemental tear treatment is the complete removal of the torn cementum fragment to restore the affected tooth to periodontal health.³ The present case provides an overview of cemental tears, focusing on a novel management technique, adjunctive biocompatible materials used, and subsequent healing of a maxillary lateral incisor site.

CASE REPORT

A 61-year-old male presented to the endodontic clinic with a chief complaint of a “painful bump on his gums”. He reports the pain started 2 months prior after he bit into an apple. The patient was first treated by another specialist who performed root canal therapy on the involved tooth, which reduced, but did not resolve the clinical signs or symptoms. Clinical evaluation revealed the presence of a sinus tract on the buccal mucosa of the right maxillary lateral incisor, tooth 12(#7 US) (Fig. 1). A high-resolution, small field of view (FOV),



Figure 1: Clinical photograph of sinus tract opening, yellow arrow, on the buccal mucosa right maxillary lateral incisor, tooth #7.

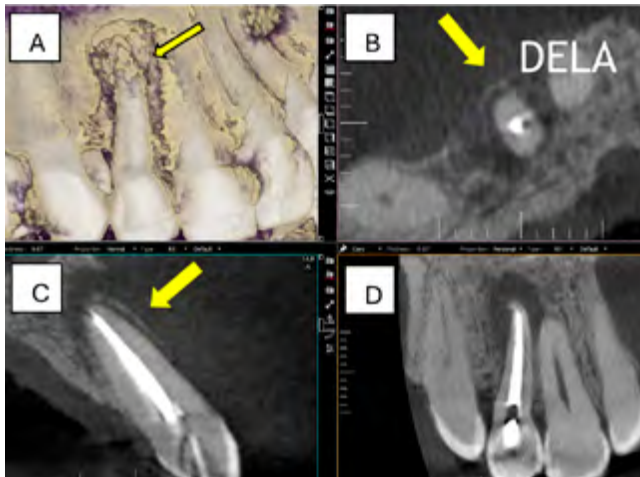


Figure 2A-D: CBCT imaging. Yellow arrows pointing to cemental tear on 3D reconstruction image (A), axial slice (B), sagittal slice (C), and coronal slice (D).

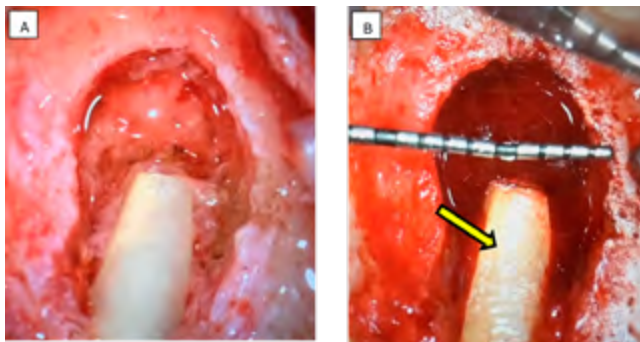


Figure 3A-B: Intraoperative clinical photographs; A. Post root resection; B. Chalky appearance of root surface observed after conditioning with SFT-8 laser tip

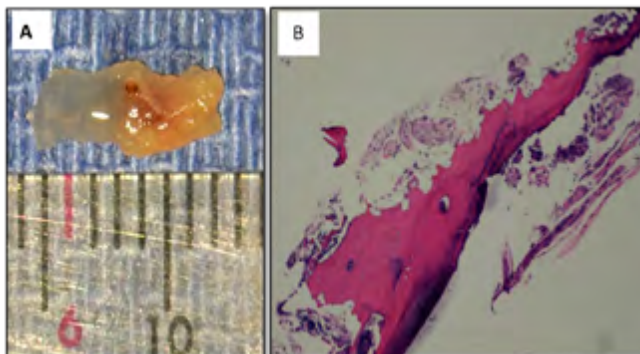


Figure 4A-B: A.Fragment measuring 8mm in length; B.Histologic section of fragment, stained with H&E, revealed a fragment of cellular cementum.

CBCT scan revealed a large, well-defined, non-corticated low-density area surrounding the apical aspect of the tooth perforating the buccal cortical plate without expansion. An irregularly shaped high-density area indicative of a cemental tear on the labial aspect of the apical third of the root was also noted, as seen in the axial and coronal slices (Fig. 2).

TREATMENT OPTIONS

Management strategies for cemental tears depend on the location of the cementum fragment. They may include scaling and root planing (SRP), open flap curettage, apical surgery in cases with concomitant periapical pathosis, intentional replantation, or tooth extraction. Each approach is adapted to the specific clinical presentation and severity of the tear. However, despite these potential treatment options, further research is crucial to establish clear, evidence-based guidelines to ensure optimal patient outcomes while preserving the natural dentition. In this case, due to the specific location of the cemental tear and the tooth's prior history of endodontic treatment, apical surgery in concert with the complete removal of the cemental tear fragment presented the most appropriate clinical approach.

TREATMENT

A full thickness mucoperiosteal flap was reflected from the mesial of tooth 11(#8 US) to the distal of tooth 13 (#6 US), with bilateral vertical releases at the terminal ends. The cemental fragment was identified and removed from the root surface. Root resection (Fig. 3A) of tooth 12 (#7 US) was performed utilizing the Biolase iPlus, Er, Cr: YSGG, 2780nm laser,

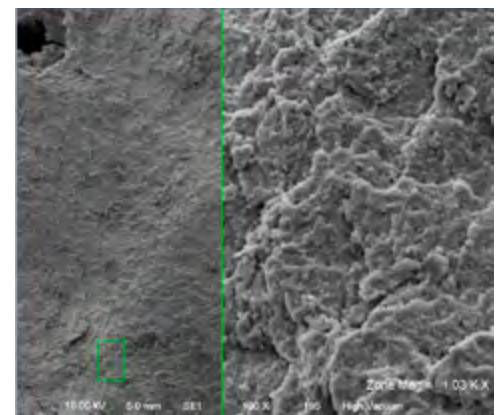


Figure 5A-B: SEM images of the surface of a resected root apex after laser root surface decontamination. No visible dentinal tubules are observed. Image 'B' is higher mag (1000x) of green box area in image 'A'. (Courtesy- Dr. Issac Kably)

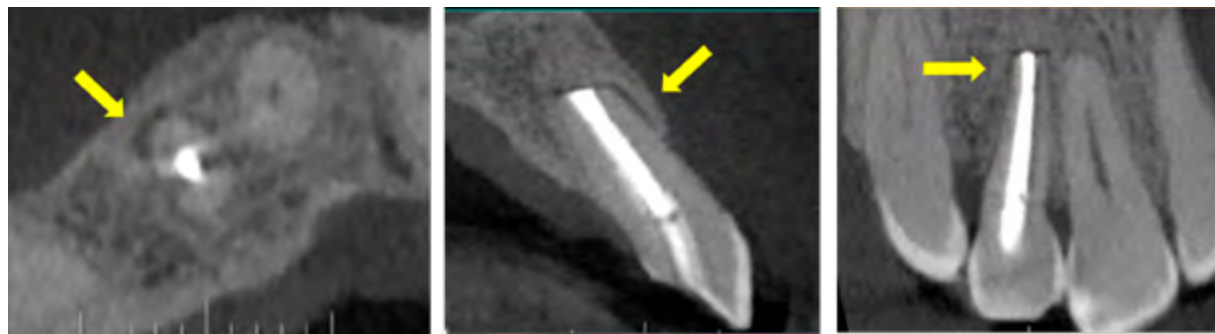


Figure 6A-C: 1 year post-op imaging. Yellow arrows point to complete osseous healing of buccal cortical and periapical bone; A. Axial slice; B. Sagittal slice; C. Coronal slice

with a MZ6-14mm tip, at the custom settings of 5W, 25Hz, H-mode, Air 40/Water 80. Excess granulation tissue was ablated with the MZ6-14mm tip at 2.5W, 30Hz, H-mode, Air 20/Water 50. Following the removal of the granulation tissue, the resected root end was stained with methylene blue and inspected for fractures or anomalies. After confirmation, root end preparation was performed using an ultrasonic handpiece (Acteon) and diamond coated tip. For root surface decontamination, the Waterlase Side-Firing Tip (SFT-8, Biolase) was used at the settings of 1.5W, 30 Hz, H-mode, Air 40/Water 50, in a circular 1mm/sec motion over the root end and exposed facial surface of the root until these surfaces appeared chalky/etched (Fig. 3B). The root end preparation was sealed with Endosequence BC putty (Brasseler). A bone allograft (BioHorizons, MinerOss 50:50 cortical/cancellous bone) and membrane (BioHorizons, Mem-Lok) were placed, and the flap was coapted and closed with 6/0 and 7/0 polypropylene sutures (Henry Schein).

CLINICAL AND HISTOLOGICAL APPEARANCE

The delaminated cementum fragment (Fig. 4A-B) was submitted for histological examination, revealing a cellular cementum-like hard tissue fragment.

As described above, root surface decontamination has demonstrated apparent surface melting and ablation of dentinal tubules (Fig. 5A-B) to seal any intratubular microorganisms, preventing persisting infection or reinfection.

1-YEAR POST-OPERATIVE ASSESSMENT

The patient returned for a one-year post-operative exam and has been asymptomatic. The sinus tract

resolved prior to the one-month post-op visit, and a new CBCT scan revealed osseous healing of the periapical area and the buccal cortical bone (Fig. 6A-C, yellow arrows).

CONCLUSIONS

Cemental tears pose significant diagnostic and therapeutic challenges for clinicians.^{1,2} Accurate identification of these lesions necessitates the using high-resolution, small field of view (FOV), cone-beam computed tomography (CBCT), which provides detailed imaging to confirm the presence of cemental delamination.^{1,5}

In cases where surgical intervention is appropriate, the surgical removal of the cemental fragment, combined with laser root surface conditioning, has emerged as a viable treatment option. This approach is particularly suitable for patients who can tolerate endodontic and periodontal surgical procedures, offering a potential pathway for tooth preservation and improved clinical outcomes. ■

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**Dr. Stephen P. Niemczyk**

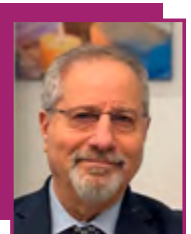
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ER,Cr:YSGG LASER-ASSISTED PERIODONTAL THERAPY IS BENEFICIAL FOR EARLY HEALING IN SEVERELY DAMAGED PERIODONTAL SITES

A Randomized Controlled Split-mouth Clinical Trial

By Dr. Jung Soo Park, Dr. Hannah Jung, Dr. Jae-Jun Ryu, Dr. Ki-Tae Koo, Dr. Jaebum Lee

Originally published in BMC Oral Health 24, 539 (2024) DOI: 10.1186/s12903-024-04270-1

INTRODUCTION

The efficacy of laser application in periodontal treatment is still debatable. Various laser instruments are available in the market, and each instrument has its own working range of wavelength and energy level that originates from the type of medium utilized in the equipment. Therefore, various lasers that have been frequently used and studied in the dental field since the 1990s have different indications and characteristics, although they share general mechanisms. These include lasers such as carbon dioxide, neodymium-doped:yttrium, aluminum, and garnet (Nd:YAG), erbium-doped:yttrium, aluminum, and garnet (Er:YAG), erbium, chromium-doped:yttrium, scandium, gallium, and garnet (Er,Cr:YSGG), and diode lasers (Aoki *et al.*, 2015).

The Er,Cr:YSGG laser has a high absorption coefficient for water, especially OH⁻ ions, with a relatively high emission wavelength (2,780 nm). This causes the laser energy to be largely absorbed in the superficial layer of the tissue and does not penetrate deep into it. Energy absorbed water molecules evaporate easily by photo-thermal effects, increase intra-tissue pressure by vapors created within the tissue, provoking “micro-explosions” in the end that cause mechanical breakdown of the tissue. This series of process is called tissue ablation (Aoki, Sasaki, Watanabe, & Ishikawa, 2004; Nelson *et al.*, 1988). Applying Er,Cr:YSGG laser in periodontal treatment, precisely

at the stage of degranulation of periodontal pockets, enables the removal of inflamed tissue without causing unnecessary side effects, such as thermal damage and uncontrolled destruction of the underlying tissue. Moreover, abundant plausible evidence suggest that bacteria colonizing within or beyond the pocket epithelium can be destroyed or inactivated by laser irradiation (Clem *et al.*, 2021). Therefore, laser-assisted periodontal treatment aids in the removal of calculus from deep pockets and enables elimination of infected pocket lining tissue as a direct step, so that complete disinfection can be achieved far more reliably compared to that by conventional scaling and root planning (SRP).

MATERIALS AND METHODS

STUDY POPULATION

This study was designed as a split-mouth, single-blinded, randomized controlled clinical trial. Among the patients who visited the Department of Periodontology, Korea University Anam Hospital from May 2020 to April 2021, 13 patients aged 36–67 (mean age 52.2) years were recruited.

The inclusion criteria were as follows: (a) diagnosis of stage III or IV periodontitis based on the 2017 periodontitis classification (Tonetti, Greenwell, & Kornman, 2018); (b) minimum of two teeth with probing depth (PD) >5 mm and

radiographic bone loss in at least two quadrants of the whole dentition; (c) each quadrant with a minimum of four teeth; and (d) systemically healthy patients.

TEST PROTOCOL

Periodontal treatment was performed by a single periodontist (J.S.P). SRP was performed using Gracey curettes and an ultrasonic scaler. Supra and subgingival calculi were meticulously removed from the root surfaces. For the test quadrants, an Er,Cr:YSGG laser (Waterlase Express™, Biolase, Foothill Ranch, CA) was applied during the SRP procedure. The details of each step are as follows:

- 1) De-epithelization and retraction: MZ 6 (Biolase Technology, San Clemente, CA, USA) (1.5 W, 40% air/50% water, 30 Hz, H mode)
- 2) SRP with Gracey curettes and ultrasonic scaler
- 3) Sulcular debridement and degranulation: Radial firing perio tip (RFPT) 5 (Biolase Technology, San Clemente, CA, USA) (1.5 W, 40% air/50% water, 30 Hz, H mode)
- 4) Outer pocket de-epithelialization: RFPT 5 (1.5 W, 40% air/50% water, 30 Hz, H mode)
- 5) Pressure dressing with wet gauze

Patients were instructed to refrain from tooth brushing for 3 days after treatment.

Table 1a: All sites — Mean values and changes for PPD, CAL, and MGI

Variable	N	Baseline		1w		2w		4w		8w			
		Mean (SD)		Δ (SD)		Mean (SD)		Δ (SD)		Mean (SD)		Δ (SD)	
PPD													
Control	40	5.00 (0.99)						3.64 (0.91)	-1.37 (0.63) *	3.54 (0.76)	-1.46 (0.63) *		
Test	40	5.00 (0.97)						3.33 (0.73)	-1.67 (0.59) *¶	3.25 (0.69)	-1.74 (0.68) *		
CAL													
Control	40	5.80 (1.43)						4.59 (1.25)	-1.21 (0.79) *	4.48 (1.31)	-1.33 (0.84) *		
Test	40	5.49 (1.10)						4.06 (1.02) #	-1.43 (0.94) *	4.07 (1.00)	-1.42 (1.01) *		
MGI													
Control	40	2.74 (0.50)	1.93 (0.53)	-0.80 (0.66) *	1.52 (0.83)	-1.22 (0.85) *	1.55 (0.79)	-1.19 (0.67) *	1.79 (0.77)	-1.25 (0.77) *			
Test	40	2.81 (0.43)	1.70 (0.53)	-1.07 (0.45) *¶	1.41 (0.82)	-1.42 (0.67) *	1.31 (0.75)	-1.51 (0.67) *¶	1.12 (0.71) #	-1.69 (0.65) *¶			

Table 1b: Teeth with mean PPD ≥5 mm — Mean values and changes for PPD, CAL, and MGI

Variable	N	Baseline	1w		2w		4w		8w	
		Mean (SD)		Δ (SD)	Mean (SD)		Δ (SD)	Mean (SD)		Δ (SD)
PPD										
Control	20	5.75 (0.73)					4.17 (0.91)	-1.58 (0.56) *	4.00 (0.75)	-1.75 (0.62) *
Test	20	5.71 (0.82)					3.73 (0.75)	-1.98 (0.55) *¶	3.63 (0.71)	-2.08 (0.64) *
CAL										
Control	20	6.59 (1.16)					5.25 (1.27)	-1.34 (0.67) *	5.12 (1.25)	-1.47 (0.82) *
Test	20	6.06 (1.05)					4.27 (1.05) #	-1.79 (0.94) *	4.21 (1.00) #	-1.85 (0.96) *
MGI										
Control	20	2.95 (0.46)	1.79 (0.44)	-0.74 (0.52) *	1.79 (0.87)	-1.14 (0.79) *	1.74 (0.71)	-1.03 (0.53) *	1.49 (0.74)	-0.98 (0.61) *
Test	20	2.88 (0.46)	2.14 (0.46) #	-1.19 (0.40) *¶	1.74 (0.84)	-1.16 (0.71) *	1.85 (0.74)	-1.21 (0.53) *	1.90 (0.61)	-1.46 (0.62) *¶

*: Statistically significant difference in comparison to the baseline value (P <0.05, analyzed using repeated measure ANOVA)

#: Statistically significant difference in comparison to the control group in the same period (P <0.05, analyzed using Mann-Whitney U test)

¶: Statistically significant difference in comparison to the control group in the same period (P <0.05, analyzed using t-test)

PPD, probing pocket depth; CAL, clinical attachment level; MGI, modified gingival index, SD, standard deviation

A chlorhexidine rinse was prescribed twice daily for 7 days. Patients were instructed to take painkillers (500 mg acetaminophen) if the pain was irresistible.

STUDY PROCEDURES AND OUTCOME MEASURES

At the first visit, patient screening was performed via a clinical examination. Prior to the consent for the study, patients were provided with detailed information regarding the study, including the study plan, intervention method, material characteristics, possible side effects, and patients' right to refuse or discontinue study participation. Oral hygiene instructions were provided to the enrolled patients using disclosing solution and plaque control devices, including manual toothbrushes and interdental brushes.

On the day of treatment, baseline measurements were taken, and gingival crevicular fluid (GCF) samples were collected prior to treatment. Teeth having at least one site with PPD >5 mm were subject for analysis. Clinical examination included probing pocket depth (PPD), gingival recession (REC), modified gingival index (MGI)(Lobene, Weatherford, Ross, Lamm, & Menaker, 1986), bleeding on probing (BOP), plaque index (PI), and mobility (Mob). The PPD and REC were measured (mm) at six sites per tooth. Clinical attachment level (CAL) was calculated as the sum of PPD and REC measurements. The MGI and PI were measured at four and two sites, respectively. GCF sampling and MGI, PI, and Mob measurements were performed at 1, 2, 4, and 8w post-operative visits. PPD, CAL, and BOP were measured at 4 and 8w. Data measurements were conducted by a separate periodontist who was not engaged in the treatment procedure.

Table 2a: All sites — Clinical measurements for BOP and PI

Variable	N	Baseline	1w	2w	4w	8w
PI						
Control	40	1.45 (0.95)	0.66 (0.67) *	0.41 (0.55) *	0.99 (0.80) *	1.08 (0.97) *
Test	40	1.4 (0.79)	0.5 (0.63) *	0.74 (0.71) *#	0.94 (0.81) *	0.88 (0.90) *
BOP						
Control	40	0.77 (0.32)			0.53 (0.27) *	0.48 (0.27) *
Test	40	0.90 (0.19)			0.47 (0.33) *	0.40 (0.30) *

Table 2b: Teeth with mean PPD ≥ 5 mm — Clinical measurements for BOP and PI

Variable	N	Baseline	1w	2w	4w	8w
PI						
Control	20	0.84 (0.32)			0.60 (0.24) *	0.60 (0.23) *
Test	20	0.90 (0.21)			0.61 (0.32) *	0.55 (0.31) *
BOP						
Control	20	1.48 (0.82)	0.55 (0.67) *	0.65 (0.69) *	1.10 (0.84)	1.00 (0.97)
Test	20	1.55 (1.18)	0.65 (0.73) *	0.28 (0.44) *#	1.13 (0.93)	1.28 (0.92) *

*: Statistically significant difference in comparison to the baseline value ($P < 0.05$, analyzed using repeated measure ANOVA)

#: Statistically significant difference in comparison to the control group in the same period ($P < 0.05$, analyzed using Mann-Whitney U test)

PI, plaque index; BOP, bleeding on probing

The primary outcome was MGI difference at 1, 2, 4, and 8w post-operatively. Secondary outcomes included differences in PPD, CAL, and BOP at 4 and 8w follow-up, and cytokine (IL-1 β , TGF- β , IL-8) level changes in each post-operative visit.

RESULTS

Twelve patients (mean age 52.2 years), 15 quadrants per group, and 68 (control)/67 (test) teeth per group were included in the treatment procedure. While 13 patients were originally enrolled, one patient dropped out at the 3rd visit. Of the teeth included in the periodontal treatment, 40 teeth per group (control/test) with at least one site having PPD > 5 mm were subjected to analysis for changes in clinical measurements and cytokine levels. No adverse outcomes were reported in the study, and no patient reported taking medication due to pain during the entire study period.

In the initial statistical analysis, every clinical variable including PPD, CAL, MGI, PI, and BOP showed significant decrease throughout 8 w of follow-up period compared to the baseline regardless of the treatment modality (Table 1 and 3). When comparing between control and test groups, changes in MGI values were shown to be significantly greater in test group compared to the control at 1w, 4w, and 8w (Table 1a). CAL

values at 4w were significantly different between control and test groups (4.59 ± 1.25 mm vs 4.06 ± 1.02 mm, respectively, $P = 0.0706$), although these values did not show statistical difference when changes from the baseline measurements were taken into account (5.80 ± 1.43 mm vs 5.49 ± 1.10 mm at baseline for control and test, respectively). When teeth with a mean PPD ≥ 5 mm were sorted, CAL differences between the control and test groups were more apparent. At 4w, CAL values were 5.25 ± 1.27 mm and 4.27 ± 1.05 mm (control and test, respectively, $P = 0.0136$) compared to the baseline values 6.59 ± 1.16 mm and 6.06 ± 1.05 mm (control and test, respectively). The difference was also significant at 8w showing values of 5.12 ± 1.25 mm and 4.21 ± 1.00 mm (control and test, respectively, $P = 0.0163$) (Table 1b, Figure 1). At 4w, PPD reduction was significantly greater in test group (Table 1).

DISCUSSION

Overall, Er,Cr:YSGG laser application in periodontal treatment was beneficial for decreasing PPD, CAL, and MGI in the early healing period. At 4w postoperative, PPD and MGI reductions were significantly greater in test group compared to control (Table 1a). Differences in CAL values were more evident when teeth with advanced periodontal damage were identified (mean PPD ≥ 5 mm). While baseline CAL were 6.59 ± 1.16 mm

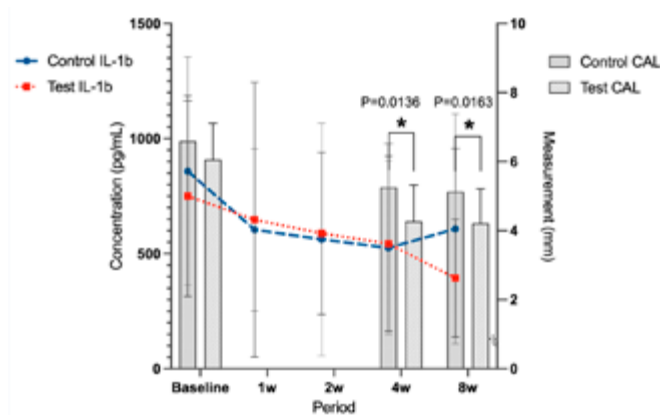


Figure 1: * Statistically significant difference between the control and test groups. CAL = clinical attachment level

and 6.06 ± 1.05 mm for control and test, respectively, CAL at 4w were 5.25 ± 1.27 mm for the control and 4.27 ± 1.05 mm ($P < 0.05$) for the test group. This difference was maintained until 8w showing 5.12 ± 1.25 mm and 4.21 ± 1.00 mm for control and test groups, respectively ($P < 0.05$, Table 2b). This suggests that the Er,Cr:YSGG laser is beneficial for reducing CAL in moderate PPD cases. GCF concentration of IL-1 β cytokine showed continuous decrease in the test group and dropped significantly at 8w corresponding well to the CAL result. These results provide sufficient evidence to support our hypothesis that Er,Cr:YSGG laser application in periodontal treatment promotes healing in the early phase.

De-epithelization and retraction performed prior to calculus removal expose the gingival sulcus, allowing visual access and a better approach to the deeper parts of the periodontal pocket. Sulcus debridement using an RFPT enables effective removal of inflammatory tissue from the inner lining of the pocket because of the radial emission of laser energy. The RFPT5-14 fiber tip with a diameter of 580 μ m and length of 14 mm as used in this study is particularly useful in multi-rooted teeth where narrow and deep pockets are present because their size and material properties provide proper accessibility and flexibility to those regions.

In our results, when teeth with an average PPD ≥ 5 mm were separately sorted, differences in CAL gain between SRP alone and laser-assisted SRP were more apparent. Provided that PPDs were measured from six sites per tooth, teeth sorted based on this criterion had at least one site with PPD > 6 mm. This indicates that teeth that may require subsequent surgical periodontal therapy due to severe attachment loss benefited remarkably from laser-assisted therapy. In terms of difference in CAL gain, laser + SRP was advantageous by approximately 0.4 mm compared to SRP alone. This number is not much different from the effectiveness of surgical therapy over SRP alone in sites with PPD > 6 mm as published in a previous meta-analysis, indicating that Er,Cr:YSGG combined with periodontal therapy exerts an influence corresponding to access flap surgery in advanced periodontal lesions. The results published in a recent article by Clem et al. (2021) also support this notion by proving the non-inferiority of Er,Cr:YSGG laser therapy in terms of CAL and PD improvements at ≥ 6 mm depth intrabony defects when compared to

surgical treatment using a minimally invasive surgical technique (Clem et al., 2021).

The purpose of cytokine analysis was to compare the activity of inflammation and wound healing objectively and numerically. However, it was found that the concentration of cytokines varies considerably among individuals as well as teeth within a patient, showing large standard deviations in cytokine concentrations.

In conclusion, Er,Cr:YSGG-assisted periodontal therapy using RFPT is beneficial for CAL gain than by SRP alone during the early healing period, and the benefit is maximized, especially in teeth with an average PPD ≥ 5 mm. ■

ACKNOWLEDGEMENTS

A grant from Biolase funded the study. The authors declare no conflicts of interest.

The full article can be found at:
PMID: 38720276 P
MCID: PMC11080134

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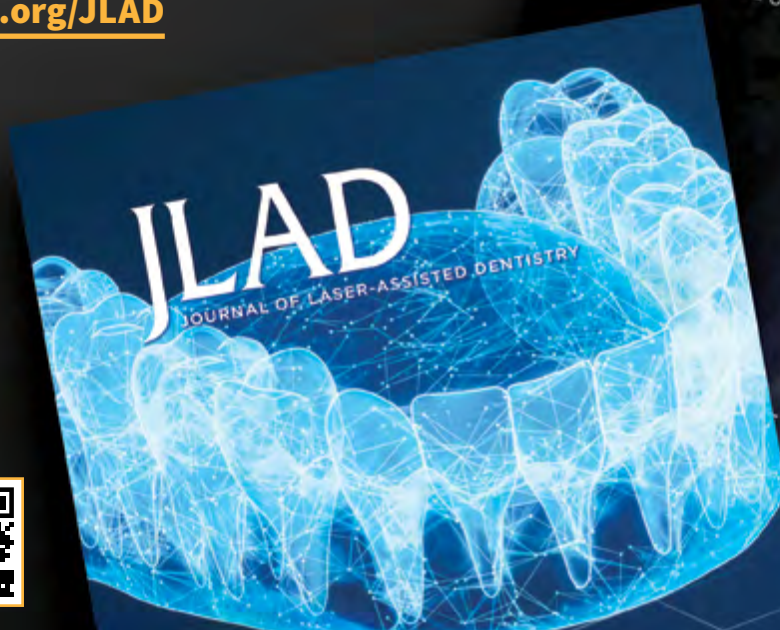


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EFFICACY OF ER,Cr:YSGG LASER APPLICATION IN THE NON-SURGICAL TREATMENT OF PERI-IMPLANTITIS

A Human Randomized Controlled Trial

By Philip Kang, DDS, Elena Sanz-Miralles, DDS, MS, MSc, PhD, Jessica Li, DDS, MS, Eric Linden, DMD, MSD, MPH, Fatemeh Momen-Heravi, DDS, MS, PhD, MPH

Int J Periodontics Restorative Dent 2023;43:e1-e9. doi: 10.11607/prd.6384



INTRODUCTION

Despite the different treatment modalities for peri-implant mucositis and peri-implantitis, there still is an unmet need for a predictable and noninvasive treatment.¹ A variety of surgical modalities, such as conventional resective and regenerative surgeries, chemical agents, implantoplasty, and lasers, have been proposed to treat peri-implantitis.²⁻⁴ Lasers have been used mostly as an adjunctive therapy to traditional approaches. Erbium-based lasers such as Er,Cr:YSGG have shown to possess several advantages: Their wavelength is poorly absorbed by titanium (therefore minimizing thermal damage of the implant surface),⁹ ablates calculus effectively,¹¹⁻¹³ and has been shown to reestablish bone-to-implant contact.¹⁴

RESULT

After adjusting for baseline values and subjects by a mixed-model ANCOVA, the laser-treated implants showed a statistically significant reduction in PD compared to the control group ($P = .04$). No statistically significant differences in PI, BOP, or CAL were observed after adjusting for covariates. There was no statistically significant difference between the two groups (Table 2). The mean (95% CI) PD reduction of treated implants was -0.73 mm (-1.17 mm, -0.28 mm) for the control group and -1.36 mm (-1.96 mm, -0.77 mm) for the test group. Considering the composite outcome of disease resolution, 5% of implants in the control group and 21% of implants in the test group showed complete resolution of diseases. (Fig. 2)

Figure 3 illustrates the results of the subgroup analysis. After adjusting for subjects, screw-retained implants in the test

Table 1: REPAIR Implant Protocol Steps and Laser Parameters

Steps	Purpose	Tip	Power	Pulse Energy	Pulse Duration	Frequency	Air/Water % Output
Outer De-Epithelialization	Removal of outer pocket gingival epithelium	RFPT5-14	1.5 W	50 mJ	60 µs	30 Hz	40/50
De-epithelialization and Reflection	Creation of mini flaps	RFPT5-14	1.5 W	30 mJ	60 µs	50 Hz	40/50
Pocket Debridement	Scaling and root planing	Ultrasonic and hand instruments	N/A	N/A	N/A	N/A	N/A
Implant Decontamination	Cleaning of the implant surface	SFTP8-18	1.5 W	50 mJ	60 µs	30 Hz	40/50
Decortication	Bone recontouring and induction of bleeding	MZ5-14	2.5 W	80 mJ	60 µs	30 Hz	70/80
Final Sulcular Debridement	Removal of residual debris and inducing blood coagulation	RFPT5-14	1.5 W	30 mJ	60 µs	50 Hz	10/10
Pressure with 2X2 wet gauze for 5 minutes	Stabilization of the surgical field	N/A	N/A	N/A	N/A	N/A	N/A

All tips were manufactured by Biolase.

Table 2: Mean (95% CI) of the Baseline and 9 Month Periodontal and Peri-implant Parameters.

Parameter Mean (95% CI)	Group	Baseline	9 Months	Changes from baseline to 9 months (mean (95% CI))	P-value ^a
Implants					
Probing Depth (PD), mm	Er,Cr:YSGG laser (Test)	4.9 (4.4, 5.3)	3.6 (3.2, 4.1)	-1.36 (-1.96,-0.77)	0.04
	Control	4.7 (4.3, 4.9)	4.0 (3.6, 4.3)	-0.73 (-1.17,-0.28)	
Clinical attachment level (CAL), mm	Er,Cr:YSGG laser (Test)	5.7 (5.1, 6.2)	4.5 (3.9, 5.1)	-1.2(-1.97,-0.36)	0.29
	Control	5.2 (4.9, 5.5)	4.3 (4.0, 4.6)	-0.90(-1.34,-0.47)	
Bleeding on Probing (BoP), %	Er,Cr:YSGG laser (Test)	81 (69, 94)	45 (23, 67)	-36(-61, -1)	0.09
	Control	71 (55, 87)	51 (40, 62)	-20(-37, -2)	
Plaque index (PI), %	Er,Cr:YSGG laser (Test)	55 (32, 77)	26 (10, 42)	-29(-54,-2)	0.14
	Control	64 (48, 79)	34 (17, 50)	-30(-50,-8)	
Radiographic bone loss, mm	Er,Cr:YSGG laser (Test)	3.80(3.18,4.42)	3.85(3.26,4.44)	0.05(-0.80,0.91)	0.89
	Control	3.37(2.98,3.76)	3.39(2.95,3.84)	0.02(-0.56,-0.61)	

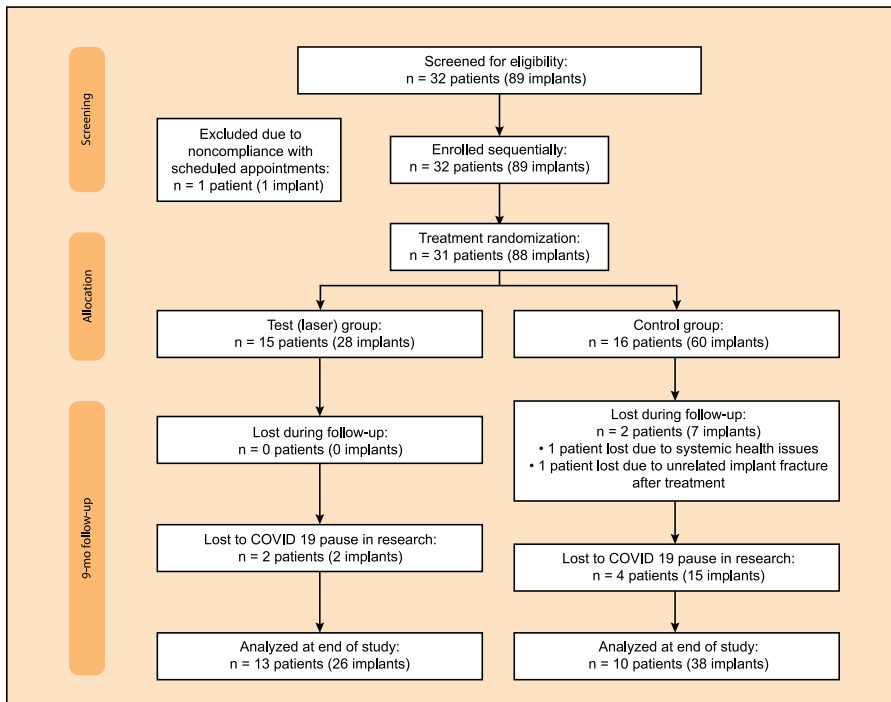


Figure 1: Flowchart of patient inclusion throughout the study period.

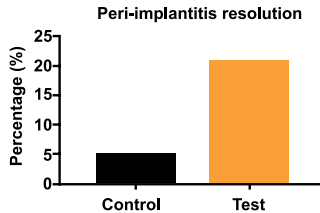


Figure 2: Bar chart demonstrating the frequency of peri-implantitis resolution, defined by the absence of PD>4, no BOP, and no additional bone loss in the test (Er,Cr:YSGG laser) and control groups.

group showed a statistically significantly greater PD reduction than the control group ($P = .01$; mean difference [95% CI]: -0.95 mm [$-1.73, -0.17$ mm]) (Fig. 3a). Mandibular implants treated with the laser demonstrated a statistically significant decrease in PD at 9 months compared to maxillary implants ($P = .03$; mean difference [95% CI]: -0.83 mm [$-1.58, -0.08$ mm]) and they also demonstrated a statistically significant decrease in PD at 9 months compared to the control group ($P = .002$; mean difference [95% CI]: -1.11 mm [$-1.78, -0.44$ mm]) (Fig. 3b). Singleunit implants treated with the laser showed a statistically significant decrease in PD compared to the

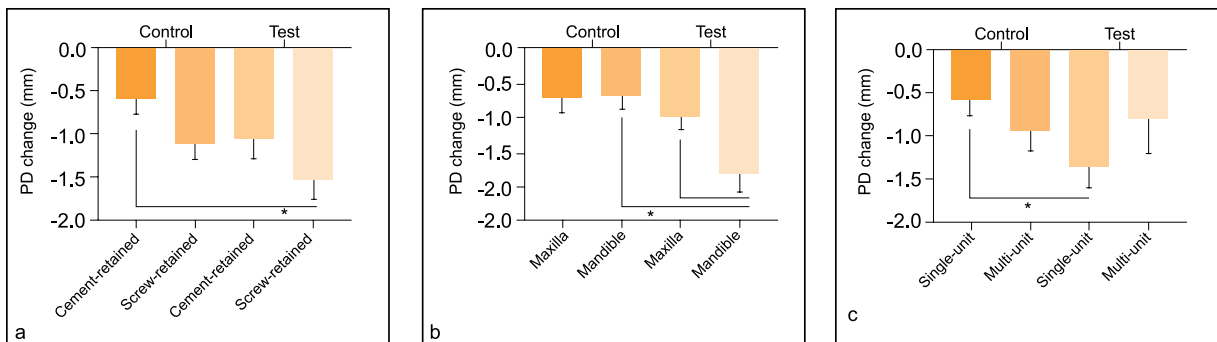


Figure 3: Subgroup analyses were performed to account for other local predisposing factors for peri-implantitis. Asterisks indicate statistically significant differences ($P < .05$). Data are reported as the mean $\pm$ SEM (standard error of the mean) probing depth changes in the test (Er,Cr:YSGG laser) and control groups, comparing (a) maxillary vs. the mandibular implant location, (b) single-unit vs. multi-unit implants, and (c) screw-retained vs. cement-restrained implants

control group ($P = .01$; mean difference [95% CI]: -0.79 mm [$-1.40, 0.17$ mm]) (Fig. 3 c).

Based on the radiographic analysis, the mean change in mesial sites was -0.02 mm (95% CI: $-0.27, 0.24$ mm) in the test group and was 0.17 mm (95% CI: $-0.11, 0.45$ mm) in the control group ($P = .35$). The mean bone level change at distal sites was -0.10 mm (95% CI: $-0.41, -0.21$ mm) in the test group and was -0.03 mm (95% CI: $-0.25, 0.19$ mm) in the control group ($P = .71$). No adverse event was observed in either group.

CONCLUSIONS

The adjunctive use of an Er,Cr:YSGG laser for the nonsurgical treatment of peri-implantitis led to greater PD reductions than mechanical debridement alone, but no additional benefits were seen for CAL gain or BOP reduction. The Er,Cr:YSGG laser also showed increased benefits in the treatment of mandibular, screw-retained, and single-unit implants. ■

ACKNOWLEDGEMENTS

A grant from Biolase funded the study. The authors declare no conflicts of interest.

The full article, originally published in the *Int J Periodontics Restorative Dent* 2023;43:e1-e9. doi: 10.11607/prd.6384, can be found at <https://pubmed.ncbi.nlm.nih.gov/36661870/>

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Management of Pyogenic Granuloma Using All Tissue YSGG Laser

A Case Report

By Dr. Sucheta Jala, Dr. Pankaj Dhawan, Dr. Ashish Kakar (Manav Rachna Centre for Dental Excellence, MRIIRS)

ABSTRACT

Introduction: Pyogenic granuloma (PG) is a common tumour like inflammatory hyperplasia of skin and oral mucosal membranes considered as non-neoplastic often caused by a constant low-grade local irritation or trauma, poor oral hygiene or many hormonal factors (drug induced or pregnancy type being the most common precipitating factor). Surgical excision is the choice of treatment, with the advancements and introduction of non-invasive treatment modalities such as cryosurgery, sclerotherapy, flash lamp pulsed dye laser, Nd:YAG laser, carbon dioxide (CO₂) laser, Er,Cr:YSGG lasers, the results are more accurate and precise. In the present case series, Er,Cr:YSGG is the more appropriate recommended technique.

Aim : The aim of this case series is to assess the difference in the choice of treatment, recovery and recurrence of PG.

Case Series: The case series includes 3 cases with different age group, with chief complain of swelling and bleeding occasionally. The treatment plan includes surgical excision of the lesions using Er,Cr:YSGG all tissue laser at 2-3W power setting under local infiltration using 2% lidocaine for the precise bloodless excision of the lesions. On histopathological reporting, the overgrowths were suggestive of Pyogenic Granuloma. Results: In all the 3 cases, patients reported no pain on post surgical followup. Patients were prescribed Benzocaine I P 20%w/w gel, and 0.2% chlorhexidine mouthwash and instructed on necessary post-operative instructions. No recurrence or scarring was observed in 3 months follow-up in any of the 3 cases.

Conclusion: Laser, especially all tissue like Er,Cr:YSGG Laser is a secure and efficient technique for the treatment of intra-oral PG, however in order to minimize its recurrence, the lesion should be excised with a wider margin, and a long-term follow-up is recommended.

INTRODUCTION

Patients frequently present with mucogingival overgrowth either localized or widespread of odontogenic origin which mimics the stroma of the periodontal ligament (PDL). The most widely used terminology is pyogenic granuloma (PG) or granuloma pyogenicum.¹ The Greek language refers it as 'epi' and 'olun' which means on the gum. However, because of its vascularity, the scientific nomenclature is "Lobular Capillary Hemangioma" (LCH). Other common terminologies include are Periodontal Epulis, Benign vascular tumor, Pregnancy Granuloma, vascular epulis, fibroangioma, non-lobular capillary hemangioma and Crocker and Hartzell's disease.² When examined clinically, a PG appears as a smooth sessile mass or as lobular pedunculated lesions having propensity to hemorrhage. The appearance of the painless lesion is linked to a number of etiological factors, in 16% of cases, including recent low-grade trauma or irritation, poor oral hygiene, hormonal imbalances, pregnancy related hormonal factor that increases vascular response potential and numerous medications like oral contraceptives, cyclosporine, carbamazepine.³ Oral stimuli are dental calculus, biofilm, primary teeth exfoliation, primary tooth injury, defective restorations, food impactions, periodontitis, occlusal interference, repeated chronic irritation and trauma. PG appears most commonly in the age group of 10-40 years with peak in second and fifth decade, with higher incidence in female during pregnancy accounting for approximately 5%, with male-female ratio of 1:2.⁴

Kerr et al suggest, staphylococci, botryomycosis & accumulation of foreign particles in lining of blood vessel being the major factor in advancement of lesion.⁵ Bhaskar and Jacoway suggested the presence of contaminants from oral microflora more towards the surface. Reichart and Philipen found fibrin to resemble pus in the granulation tissue of oral pyogenic granuloma.⁶ Regezi et al. suggested PG as "reactive" or "reparative" process, where etiological factors like use of long term drug therapy causes proliferation of fibroblasts, increased collagen synthesis triggers hyperplasia and later PG.⁷ Hormones like Estrogen, Progesterone and Chorionic Gonadotropin, cause alterations resulting in immune suppression in periodontal tissues preventing acute

inflammatory response, increased chronic tissue reaction, and decrease antimicrobial activity, leading to severity in pathologies.⁸

In multiple retrospective studies it was established that of all 75% of non-neoplastic lesions of oral cavity PG-associated prevalence was found in almost 50-52.7% of all reactive oral lesions, appearing as tiny erythematous papules.⁹ Extra-gingival occurrence is reported only in one third of the cases, while tongue (4%) and lip (3%).⁴ PG appears as exophytic growth on pedunculated or sessile base with smooth, lobulated red hemorrhagic compressible papules. These are mainly slow, asymptomatic and painless, bleed profusely on probing due to increased vascularity. Newly formed lesions appear red, older ones as fibrous pink in color.¹⁰ Histologically, PGs are composed of hyperplastic granulation tissue of non-neoplastic proliferation with abundant blood vessels. Acute and chronic inflammatory cells, lymphocytes, plasma cells, fibroblasts, partial or total parakeratotic stratified squamous epithelium are major microscopic features.³ Peripheral giant cell granuloma with multinucleated cell, hemangiomas, red or reddish-blue growth, gingival hyperplasia, conventional granulation tissue, peripheral ossifying fibroma, Kaposi's sarcoma,

angiosarcoma, and non-Hodgkin's lymphoma are some of the possible differential diagnosis, exhibiting endothelial cell proliferations and blood vessel developments at microscopic levels.^{9,11}

Management of oral PG depends on specific patient clinical condition. The most accepted treatment option still remains the surgical excision, however other minimally invasive treatments utilizing different types of laser with various wavelengths, corticosteroid injections, cryosurgery and sclerotherapy (using ethanol or sodium tetradecyl sulfate).¹² Recently, Laser has become widely used tool of choice for various soft tissue excisions due to their precision and superior hemostasis. Laser also maintains the sterile environment, accurate cutting and clean incisions, use of fewer instruments, eliminates the need of bandages or suture, reducing pain during and after the procedure, lesser scarring, less utilization of manpower and time. Currently different wavelength lasers are used, these include Diode Laser, CO₂ (Carbon Dioxide Laser), Nd:YAG (Neodymium-Doped Yttrium Aluminium Garnet), Erbium Family amongst others.^{13,14}

CASE REPORT 1

A 34-year-old woman was referred to Manav Rachna Centre for Dental Excellence, specialized centre for dental care under the aegis of Manav Rachna Dental College with a chief complaint of gingival growth and bleeding while brushing. The patient had a history of diabetes, and hormonal imbalance. After thorough clinical examination and evaluation, all relevant parameters were found to be normal. A localized muco-gingival mass [Fig.1a] extending onto the incisive papillae of teeth 11 and 21 was observed. The lesion had a reddish-pink color, relatively soft in consistency with a mild ulcerative hemorrhage. Lesion measured to be 3mm by 2mm in diameter and 2mm in thickness. Being present in the esthetic zone, a non invasive surgical technique using the Er,Cr:YSGG 2780nm all tissue laser was used. Consent for the use of laser and anesthesia were obtained.

2% Lidocaine with Epinephrine 1:100,000 were used as anesthetic agent for infiltration around the surgical site, avoiding direct infiltration of the lesion. Er,Cr:YSGG surgical laser of 2,780nm wavelength (Waterlase iPlus®, Biolase®, CA, USA) was used with a fibre optic tip size MZ5 with 40% air and 60% water delivery system in non-contact mode of 1-2mm distance from the tissue for optimal outcome, clean cut and least tissue damage. Protective eye wear was worn by patient, assistant and the operator as per

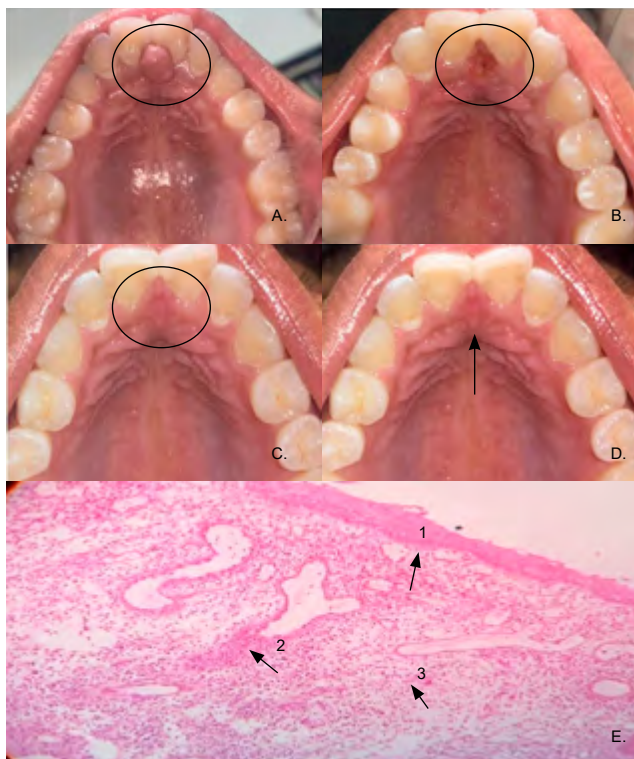


Figure 1

A. Pre-operative, B. Immediately post-excision of the tissue using laser, C. 15-day post-operative follow-up, D. 3-month healing follow-up with no sign of scarring or white cast, E. Histological staining image of overgrowth: 1. Stratified squamous epithelium; 2. Granulation tissues; 3. Lobular arrangement of capillaries

Laser Safety standards. The power setting was set to 4W, 20Hz, H-mode with tip diameter of 500U diameter. Haemostasis was well achieved [Fig.1b]. A dose of Low Level Laser Therapy using the 940nm Epic X® diode laser (Biolase®, Foothill Ranch, CA, USA) in continuous wave mode of 1.25W defocused 1cm away, with no tip in the surgical handpiece was done for 2 cycles of 40 second each from buccal and palatal side. The surgical site was cleaned using a sterile gauge soaked in 1% normal saline. Patient was informed about complications like numbness, pain, redness, swelling or ulceration around the excised area or even extra orally. A local ointment (Benzocaine I P 20%w/w gel 15g) 3 times a day, along with Chlorhexidine mouthwash (0.2 %) was also recommended to maintain the oral hygiene.

A routine follow up was done at 24 hours, 1 Day, 3 Day and 15 days thereafter [Fig.1c]. Patient was further recalled for a follow up check up after 3-months [Fig.1d]. On follow up examination a complete healing of the marginal & attached gingival with no scarring or discoloration of the gingiva, no discomfort or signs of reoccurrence were observed. The tissue sample obtained post excision was

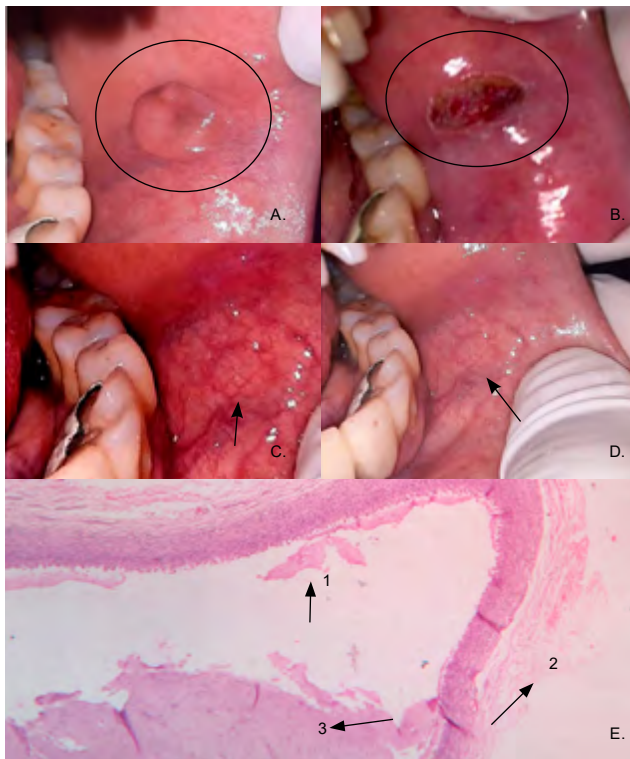


Figure 2

Figure 2: A. Pre-operative soft growth on the inner vermilion of the lower lip, B. Clean excision of the growth using 2780nm Er,Cr:YSGG laser, C. 15 Days post-excision follow-up, D. 3-month follow-up with no scarring and clean gingival fold and no sign of reoccurrence, E. Histological staining: 1. Ulcerative surface along pedunculated mass; 2. Sub-acute inflammatory cell infiltrate

placed in 10% formaline and sent for histological analysis. Hematoxylin and eosin staining was suggestive of a highly proliferative and inflammatory granulomatous tissue with infiltration of lymphocytes, plasma cells and areas of connective tissue confirming the differential diagnosis of PG or proliferative muco-lingival lesion [Fig.1e].

CASE REPORT 2

A 45 year old woman was referred to the Manav Rachna Centre for Dental Excellence with the chief complaint of repeated ulceration on the inner side of lower lip. The patient medical history was non-contributory. After thorough clinical examination, a pedunculated fibrous tissue overgrowth was seen on the buccal mucosa. The lesion had a reddish, relatively soft consistency with no signs of hemorrhage [Fig.2a]. Lesion measured 3mm by 3.5mm in diameter and approximately 2mm in thickness. A non-invasive surgical excision using the Er,Cr:YSGG 2780nm all tissue Laser was done with clear margins without signs of bleeding.

Photo-bio-modulation (PBM) was done post excision [Fig.2b] to minimize, pain, swelling and redness around the lesion. 2% Lidocaine with Epinephrine 1:100,000 was used for local infiltration around the lip. Laser was used with 2.5W power setting, tip size of 500µm, MZ5 tip type with 40% air and 60% water delivery system in non-contact mode of 1-2mm distance and 10 Hertz frequency.

A complete hemostasis was achieved. Immediate cold compresses were suggested to decrease redness around the tissues. Protective eye wear was worn by all, as per Laser Safety standards. Follow up was done at 24 hours, 1 Day, 3 Day and 15 days thereafter [Fig.2c]. On follow up examination after 3 months [Fig.2d] a complete healing of the marginal with no signs of scarring was observed.

CASE REPORT 3

A 57 year old man was referred to the Manav Rachna Centre for Dental Excellence with the complaint of ulceration on the lower lip, present for 1 year. The patient gave medical history of Hypertension and associated medication for the past 25 years. After thorough clinical examination, hemangioma like papule [Fig.3a] on the right lower corner of lip was observed. Dental findings were suggestive of sharp cusp of 43 & 44 suggesting of possible causative factor. The lesion appeared bluish, relatively hard consistency with signs of hemorrhage on probing.

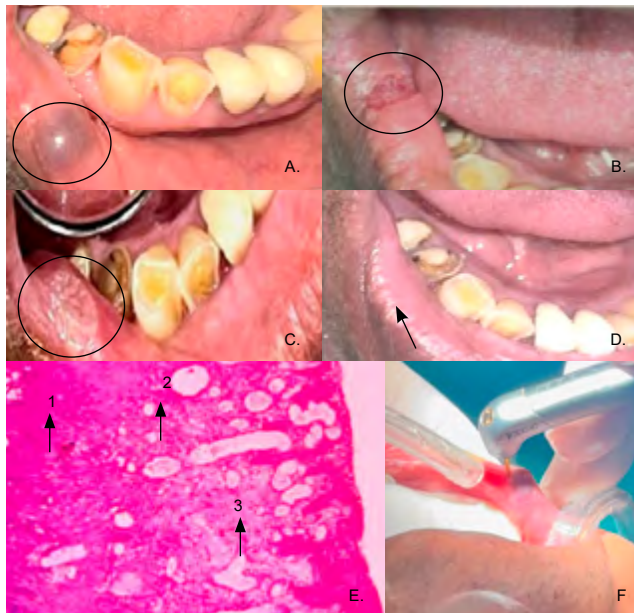


Figure 3

A. Bluish highly vascular traumatic ulceration on the vermilion of lip towards corner of lip, B. Immediately after excision with least evidence of bleeding, C. 15 days post laser excision shows complete healing with no evidence of scarring, D. 3 Months Post Operative, E. Histological Staining (Highly Vascular Lobular Mass), F. Excision of the granuloma on the corner of the mouth using 2780nm Er,Cr: YSGG All Tissue Laser.

Lesion measured to be 2mm in diameter and approx 1.5mm in thickness. A non-invasive surgical excision using the Er,Cr:YSGG 2780nm all tissue laser was done with minor bleeding due to increased vascularity [Fig 3b]. Photo-bio modulation (PBM) was done post excision to minimize, pain, swelling and redness around the lesion. 2% Lidocaine with Epinephrine 1:100,000 was used for local infiltration around lesion. Laser was used with 2W power setting, tip size of 500µm, 10 Hz frequency, MZ5 tip type with 40% air and 60% water delivery system in non-contact mode of 1-2mm distance. A complete hemostasis was achieved with mild hemorrhage during excision. Protective eye, as per Laser Safety standards was worn. Enameloplasty was done to reduce further trauma around the attrition. Follow up was done at 24 hours, 1 Day, 3 Day and 15 days thereafter [Fig.3c]. On follow up examination after 3 months [Fig 3d] a complete healing with no signs of scar was observed.

DISCUSSION

In 1844, the first clinical case of pyogenic granuloma was witnessed by Hullihen,¹⁵ later in 1903, Crocker termed it as pyogenic granuloma. PG is not a true granuloma as it does not contain pus cells, thus appearance is of a non-neoplastic lesion which was confirmed on both clinical and histopathological findings.¹⁵ In this case series, lesions were present

on the most prominent regions of oral mucous membrane palatal, buccal mucosa and on lip (3%).^{4,9} This case series documented two cases with females and one male, the age group ranges from mid twenty to mid fifty. Lesions have a higher predilection towards female population, confirming its association with female hormones and increased activity during the pregnancy, and accounting for almost 75% of the gingival lesions.⁸ Pyogenic granuloma has been broadly classified as: a) Non-lobular capillary hemangioma (pedunculated form) which occurred more frequently for almost 77% of the total lesions, whereas b) Lobular capillary hemangioma (sessile form) has occurrence rate of 66% of the lesions. Broadly, PG has hyperplastic stratified squamous epithelium with blood vessels, fibrin, lymphocytes present on the inner epithelial stroma.¹⁷ Past literature suggest, Laser to be a superior non-invasive treatment option for excision of such lesions with higher vascularity. Different methods have been studied over the years, for example excisional biopsy, liquid nitrogen spray, flash lamp pumped pulsed dye laser, corticosteroid injections, Sclerosing agents, Nd: YAG laser,¹⁶ Er: YAG laser,¹³ Er, Cr: YSGG laser¹⁸ (being the most recent). In this case series, Er,Cr: YSGG 2780nm was used due to its superior coagulation characteristics, with minimal to no scarring. Erbium, chromium-doped yttrium, scandium, gallium and garnet (Er,Cr: YSGG) was introduced in 1997, for surgical use due to its hydrophotonic photomechanical ablation process that removes tissue without causing heat damage, fractures or hard tissue or generates smear layer. 2780nm wavelength provides optimal energy absorption into the water laser photons energize micro water droplets and creates rapid expansion/ micro-expansion. Versatile use of Er,Cr: YSGG (Waterlase iPlus®, Biolase®, Foothill Ranch, California, USA) has advantage over other manufactured lasers and so it was also used in the cases described in this paper. Handpiece has optical fiber delivery system with sapphire crystal tip, cause hemostatic effect thus enhancing visibility during surgical procedures. In this case series, cases 1, 2 & 3 were all performed under local infiltration. A similar case report was documented in 2014, where exposure of unerupted central incisor was done without administration of local anesthesia and the procedure was immensely clean with excellent healing outcome.³ Many case reports have been documented where different types of lasers are used, Fekrazad et al¹³ used Er: YAG laser with 3W, 10Hz, 300 mJ in contact mode. Al-Mohaya used diode laser of 940nm, the results showed suture less superior healing with no pain documented. Kocaman et al¹⁶ used Nd: YAG laser to treat pyogenic granuloma of 14-year-old

female patient specifications of Nd:YAG laser for the treatment were 4W, 100mJ and 40Hz. Excision was completed in minutes and the healing process showed remarkable results in a month's time. Another study by Truschnegg utilizes carbon dioxide laser for removal of PG. Sarkar et al, also reported use of Er,Cr:YSGG in the excision of various soft tissue lesions such as peripheral ossifying fibroma, traumatic fibroma, intraoral lipoma, gingival fibroma and many other mucogingival overgrowths.¹⁹ No discomfort to patient, no local anesthesia, no suture, no antibiotic coverage, minimal to no bleeding, no edema, and good wound healing in almost 10 days were observed.²⁰

These lesions usually develop slowly without pain and are asymptomatic for major duration of its existence in oral cavity. The size ranges from few millimeters to several centimeters but most commonly seen lesions range between 2-4mm. Although PG doesn't show infiltrative tendency or malignant transformation potential but its recurrence rate after excision is about 16%,²⁰ thus in some cases re-excision is required. Recurrence happens following repeated trauma, deficient excision,¹³ Warner-Wilson Jones syndrome showed recurrence due to presence of multiple deep nodules. Effect of pregnancy or female hormones showed higher recurrence rate among females, thus treatment should be initiated after parturition. Gingival cases have higher recurrence rate than extra-gingival sites.^{2,9}

Pyogenic granuloma can be managed using several types of treatments reported in the literature, including many different wavelengths of lasers. Because the YSGG Waterlase® laser delivers precise incisions, rapid coagulation, and minimum postoperative discomfort and swellings, it was chosen as the choice of treatment approach in this case series.

CONCLUSION

A common mucogingival lesion in the oral cavity that mostly affects the mucosa is called a pyogenic granuloma. This case study provided data on the clinical manifestations, histological traits, treatment options, and possible occurrence of such complex lesions. Laser technology has gained prominence in dental surgery for its user-friendliness benefiting both the dentist and the patient. Lasers utilize both scalpel and photo thermal effect causing cells to heat, coagulation, denaturation of proteins, vaporization, and carbonization of the tissue in contact of these laser energy. Simple smaller surgical excisions using most lasers are comparatively costly treatment option than the ones with large size lesions.

On the other hand, extensive surgical excision of gingival lesions is required to eliminate any potential sources of persistent irritation. For the treatment of PG, conservative surgical excision is still the recommended option. The positive superior outcome attained with thorough excision of such lesions with an appropriate margin and base, along with a diligent monitoring over a period of three-months is highlighted in these cases. No recurrence was noted which highlights the future trajectory of diagnosis and choice of treatment of inflammatory lesions like PG. ■

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Dr. Sucheta Jala is a highly experienced and dedicated endodontist located in Hayana, India. Her passion for excellence in clinical dentistry has led her to teaching the next generation of dentists. Dr. Sucheta has a Master's in Restorative Dentistry and Endodontic from premier institute in India Pt. B.D. Sharma University of Rohtak. She received an associate Fellowship from world Clinical laser Institute (WCLI). She is a practicing Endodontist, a Laser expert and an Associate Professor at School of Dental Sciences, Manav Rachna Centre for Dental Excellence. Her academic excellence has been recognized by several prestigious awards, including the Medal of Excellence in Academics 2021, Best Employee Award 2019. Best Paper Award at Asia Pacific Conference 2017. Her commitment to continuous learning and research is reflected in her many indexed national and international publications, where she explores various facets of dental care, including dental bleaching techniques, dental ceramics, and aesthetic dentistry.

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MEET THE MASTERS

Abraham Thomas

I am a passionate and experienced dentist with a special interest in advanced laser dentistry. After graduating with a Doctor of Dental Surgery degree in 1984, I spent three decades practicing traditional dentistry in rural South Africa. By 2014, however, I had become disillusioned and frustrated with the limitations of conventional methods—particularly their invasiveness and patient discomfort.

That same year, everything changed when I attended a dental symposium in Cape Town and was introduced to the world of laser dentistry by SciVision, SA. Soon afterward, on invitation, I enrolled in an introductory laser course presented by SciVision in Johannesburg. The speaker, the



formidable and late Prof. Norbert Gutknecht, opened with a quote from Genesis 1:3 (MSG): "God spoke: 'Light!' And light appeared." As a fellow Christian, those words were life-changing for me.

From that moment, I realized that I had to invest both time and resources into mastering this transformative field. I bought my first 940 nm and 2780 nm laser in 2016, followed by a Magna Labo-Med microscope: absolute must in modern dentistry! The same year, I began a Mastership program, which quickly led me to pursue a Master of Science degree in Laser Dentistry at RWTH Aachen University in Germany, under the mentorship of Prof. Gutknecht and Prof. Rene Franzen. I was



later honoured to complete a Mastership with the World Clinical Laser Institute (WCLI) in San Diego, USA. These were among the best financial decisions of my life—because with financial pain came an even greater gain: in knowledge, in technique, and in the ability to serve my patients better.

We are known not only for one-visit root canal treatments, precision periodontal therapy, and aesthetic procedures that often require no anaesthesia or sutures, but also for addressing complex medical conditions in consultation with medical specialists. These include patients recovering from strokes, as well as those suffering from diabetic ulcers, Trigeminal Neuralgia, Bell's Palsy, and Shingles – to name only a few! Additionally, we provide Photobiomodulation Therapy (PBMT) to support patients undergoing chemotherapy and those in post-surgical recovery—helping to accelerate healing, reduce inflammation, and alleviate pain.



I've faced scepticism and criticism along the way—dismissed as the "laser guy with the funny goggles." But the results speak for themselves. I remain deeply committed to continued learning and to pushing the boundaries of what my modern laser clinic can offer.

Outside of dentistry, I find joy in the outdoors—mountain bike cycling, camping, caravanning, and enjoying a traditional South African braai with loved ones. These moments ground me in faith, nature, and fellowship. Despite our differences, we are united by shared values and by gratitude. To our Creator—the Creator of Light—be all the glory! ■



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