Er,Cr:YSGG Laser Assisted Periodontal Treatment

Authored by Jonathan Waasdorp, DMD, MS

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**Er, Cr:YSGG Laser Assisted Periodontal Treatment**

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About the Author

Dr. Waasdorp received his dental degree from the University of Pennsylvania, where he graduated with honors in pharmacology and received National Board of Dentistry Parts I and II honors. He then completed a 4-year residency at the University of Maryland and specialized in periodontics and periodontal and implant prostheses. In his final year of residency, he was selected as the recipient of the American Academy of Periodontology Lazarra Fellowship Award in Advanced Implant Surgery, which is awarded to the top periodontal resident in the country each year; the recipient engages in advanced implant surgical training along with teaching and research. He is a clinical associate professor at the University of Pennsylvania, has published articles relating to periodontal and dental implant therapy, and lectures about these topics. He is a Diplomate of the American American Board of Periodontology and maintains a private practice in Bala Cynwyd, Pa. He can be reached at (610) 660-0808 or baladentalimplants.com.

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**INTRODUCTION**

Periodontitis, which is characterized by loss of the supporting tissues of the teeth, is a prevalent oral disease that is one of the primary causes of tooth loss in humans. Early United States population studies estimated that at least 35% of the population aged 30 to 90 years had periodontitis, with 13% having a moderate or severe form. A recent update using National Health and Nutrition Examination Survey (NHANES) data from 2009 to 2012 found that these numbers were underestimated, and approximately 45% of adults aged 30 years and older have periodontitis, with 8.9% suffering from the severe form. In addition to causing loss of teeth and the associated sequelae, evidence suggests that periodontal disease is a risk factor for a variety of systemic disorders, such as cardiovascular disease, stroke, and pancreatic cancer, underscoring the importance of appropriate periodontal care.

Treatment of periodontal disease generally involves removing infection from the roots, arresting the immune response, and creating an environment favorable to both patient and professional cleansing. Nonsurgical therapy is generally effective in cases of slight to moderate periodontitis. However, in patients suffering from moderate-severe periodontitis, surgical intervention is often necessary to properly debride the roots, reduce excessive tissue, and create a positive environment for maintenance. When conditions are amenable, formation of a new attachment apparatus through periodontal regenerative procedures is the ideal solution. However, many patients present with horizontal bone loss in which regeneration is not possible, and various respective surgical procedures have been used with well documented long-term effectiveness. The aim of these procedures is to access the roots for debridement and create a better environment to maintain by both the patient and dental practitioner. With respective periodontal procedures, incisions are made, flaps are elevated, and sutures are used to reapproximate or apically position tissue.

Unfortunately, many patients do not go forth with recommended treatment due to dental anxiety and/or fear of having surgery.

As with our medical colleagues, there has been a push for less invasive treatment in order to reduce morbidity due to the procedure. The laser is one tool that has been touted as a nonsurgical alternative to periodontal surgery. Although a variety of “nonsurgical” laser protocols have been published that demonstrate histologic and clinical evidence of effectiveness, especially in situations that would be amenable to guided tissue regeneration, randomized controlled trials and long-term data are lacking. Current evidence suggests that nonsurgical laser therapy is most efficacious in deep infrabony defects. Furthermore, systematic reviews have found great heterogeneity among nonsurgical laser treatment studies and limited evidence in regards to their effectiveness.

The objective of this technical case report is to describe a minimally invasive, laser-assisted osseous surgical procedure aimed at pocket reduction in patients with moderate to advanced periodontal disease who would otherwise be treated with flap-based procedures. Compared with a scalpel, the laser can more easily cut and reshape the soft tissues of the oral cavity, with reduced bleeding and pain. The diameter and shape of the laser tip allows for precise and easy removal of interproximal granulation tissue and visualization of root surfaces. Osseous recontouring can also be safely performed with the Er, Cr:YSGG laser with minimal thermal changes. Studies have demonstrated that healing following erbium laser osteotomy with water cooling is comparable or superior to conventional mechanical techniques. Thus, the laser can be used to remove soft tissue, detoxify roots, and recontour bone to create positive architecture. This case demonstrates treatment outcomes that are similar to open flap procedures, with minimal intraoperative bleeding and postoperative discomfort. Additionally, it has been of tremendous benefit to
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anxious patients who are fearful of scalpel and suture periodontal surgery and those taking anticoagulant medications.

Clinical Technique Steps
The technique using the WaterLase iPlus (BIOLASE) 2,940-nm wavelength laser with the gold handpiece is as follows:

1. Laser pocket debridement. Use a setting of 1.5 W, 30 Hz, 40% H2O, and 50% air with radial firing tip (BIOLASE Radial Firing Perio Tip [RFPT5] 14 mm). The tip is inserted to base of pocket circumferentially and moved apico-coronally to initially remove calculus and pocket epithelium.

2. Initial incisions (Figure 1). Use a setting of 2.5 W, 75 Hz, 40% H2O, 20% air, and a sapphire chisel tip (BIOLASE MC3). Bone sounding probing depths are measured and incisions are made based on interproximal bone levels. The incisions are ideally made 1.0 to 2.0 mm coronal to this measurement to maintain interproximal periosteum and bone connective tissue coverage. The laser tip is directed interproximally to remove the interdental tissue, penetrating buccally and palatally/lingually. These are then scalloped to the interproximal areas of adjacent teeth. If there is minimal keratinized tissue, the interproximal tissue is removed to preserve at least 2 mm of keratinized gingiva and an apically positioned flap can be employed if the pocket depth reaches near the mucogingival junction.

3. Tissue removal. An Orban knife or curette is used to remove the interproximal granulation and scalloped facial/lingual tissue.

4. Root debridement using surgical debridement burs and ultrasonic instruments (Figure 2). Following calculus removal, the roots are detoxified and biomodified using laser irradiation (BIOLASE RFPT5 tip, settings of 21.5 W, 30 Hz, 40% H2O, and 50% air).

5. Bone sounding is performed to detect areas in which reverse architecture exists, mainly in the line angle regions (interproximal peaks).

6. In areas that would benefit from osseous recontouring, this is performed using the laser (BIOLASE MC3 tip, settings of 2.5 W, 30 Hz, 55% H2O, and 30% air) or end-cutting surgical carbide bur with copious irrigation.

7. De-epithelialization of the gingival wound margins (BIOLASE MC3, settings of 1.5 W, 30 Hz, 20% H2O, and 11% air) and pressure clot applied.

Postoperative instructions include twice daily rinsing with chlorhexidine 0.12% for 30 seconds for the first 2 days, then gentle tooth brushing and interproximal cleaning with interdental brushes thereafter. Patients were prescribed 600 mg of ibuprofen every 6 hours for 2 days. A soft diet should be maintained for the first week. The patient should be seen at one week for follow-up care and gentle supragingival debridement.

CASE REPORT
A 50-year-old male patient presented for treatment of periodontal disease following initial therapy at his general dentist’s office. His medical history was noncontributory; however, he was a pack-a-day tobacco smoker. A comprehensive periodontal exam (Figure 3) and full-mouth radiographic series (Figure 4) revealed generalized severe chronic periodontitis, missing teeth, occlusal trauma, and periapical pathoses.

Tooth No. 1 was extracted at his initial visit, and laser-assisted osseous surgery was performed in 2 sessions (left side and right side). The upper right quadrant is shown in this case report.

Local anesthesia was achieved using 2% articaine (1:100,000) infiltration in the maxilla and 1% xylocaine (1:100,000) inferior alveolar and long buccal nerve blocks in the mandible. Following
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pocket debridement, initial laser incisions were made interproximally (1.0 to 2.0 mm above the osseous crest) and scalloped with the adjacent teeth (Figure 5). After completing tissue removal, the roots were scaled and planed with debridement burs and ultrasonic instruments (Figure 6). Closed osseous recontouring was performed to reduce interproximal peaks and create positive architecture, and then the roots were biomodified with the laser and the gingival margins de-epithelialized (Figure 7). Tooth No. 9 was extracted and grafted in preparation for implant placement, and the anterior teeth were treated with laser pocket debridement and ultrasonic scaling, followed by de-epithelialization of the gingival margins. Each quadrant was performed in roughly 30 minutes under local anesthesia. The patient presented at one week (Figure 8) with normal healing, and reported minimal postoperative discomfort after treatment. He was seen at 3 and 6 months for periodontal maintenance. At the 6-month follow-up appointment, inflammation was minimal (Figure 9) and probing depths remain reduced (Figure 10). The results achieved in this case are comparable to traditional surgical techniques.

DISCUSSION
Surgical treatment for periodontal disease is often necessary to adequately debride infected root surfaces and remove bacteria and granulation tissue. The other objective is to create a tissue environment that is favorable for maintenance. Unfortunately, many patients avoid appropriate care due to dental fear and anxiety. Whereas traditional periodontal surgical procedures can cause significant pain and postoperative discomfort, this surgical treatment carried out with the laser significantly reduces this painful effect with most patients only requiring one day worth of over-the-counter analgesics. Compared to scalpel incisions, tissue removal with the laser results in reduced or no bleeding and pain, and osseous recontouring can be safely performed. Utilization of the Er,Cr:YSGG laser for closed osseous surgery can allay the stress for the patient as well as reduce intraoperative and postoperative discomfort.

Some authors feel the decrease in postoperative discomfort is due to a lesser inflammatory response with laser incisions, notably in a decreased amount of histamine release. Unlike open flap debridement procedures, which can lead to exposed interproximal bone, this technique leaves a small layer of periosteum and connective tissue intact that could possibly lessen the postoperative pain as well.

CLOSING COMMENTS
The case demonstrated here had comparable results to open flap procedures, but the treatment was completed faster and the patient had minimal postoperative discomfort. With regards to the anxious patient, this translates to less chair time and a greater overall experience for the patient and practitioner. Furthermore, this technique is a tremendous benefit for patients on anticoagulant medications, where the risks of discontinuing therapy for traditional periodontal surgery can have serious consequences. Most patients do not have to discontinue their anticoagulant medication.
The tremendous impact this technology can have on periodontal treatment and overall periodontal therapy underscores the need for further review and study. Future research would ideally be prospective and blinded, comparing this to traditional approaches in a split-mouth design.

References

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1. National Health and Nutrition Examination Survey data from 2009 to 2012 showed that approximately 65% of adults aged 30 years and older have periodontitis, with 24% suffering from the severe form.
   a. True    b. False

2. Nonsurgical therapy is generally effective in cases of slight to moderate periodontitis.
   a. True    b. False

3. Fortunately, many patients now go forth with recommended treatment and do not fall victim to dental anxiety and fear of having surgery.
   a. True    b. False

4. Current evidence suggests that nonsurgical laser therapy is least efficacious in deep infrabony defects.
   a. True    b. False

5. In the patient case in this article, following calculus removal, the roots were detoxified and biomodified using laser irradiation.
   a. True    b. False

6. Compared with a scalpel, the laser can more easily cut and reshape the soft tissues of the oral cavity with reduced bleeding and pain.
   a. True    b. False

7. Utilization of the Er,Cr:YSGG laser for closed osseous surgery can allay the stress for the patient as well as reduce intraoperative and postoperative discomfort.
   a. True    b. False

8. Some authors feel the decrease in postoperative discomfort is due to a lesser inflammatory response with laser incisions, notably in a decreased amount of histamine release.
   a. True    b. False
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