

Er:YAG and Nd:YAG dual wavelength-optimized periodontal therapy protocol

Combination dramatically improves outcome of laser-assisted treatments

By Harvey S. Shiffman, DDS

This protocol involves using the Fotona Lightwalker/Powerlase (Lasers4Dentistry, www.T4Med.com, San Clemente, Calif.) family of lasers containing both Er:YAG and Nd:YAG laser wavelengths and the PIPS (photon-induced photoacoustic streaming) technology. PIPS^{6,11} is an Er:YAG photoacoustic wave that enables removal of calculus, destruction of bio-film and detoxification of the cemental root surfaces in an atraumatic manner. This allows for bone regrowth and reattachment.

History of lasers in dentistry

The possibilities for laser use in dentistry did not occur until 1989¹⁰ with the production of the American Dental Laser for commercial use. This laser, using an active medium of Nd:YAG, emitted pulsed light and was developed and marketed by Dr. Terry Myers.^{7,8}

Though inappropriate for use on dental hard tissue, the availability of a dedicated laser for oral use gained popularity among dentists. In 1989, experimental work by Keller and Hibst using a pulsed Er:YAG (2,940 nm) laser, demonstrated its effectiveness in cutting enamel, dentin and bone,⁹ and these then became commercially available soon after.

Of the currently available hard-tissue lasers, Er:YAG lasers have a significantly higher affinity for water versus Er,Cr:YSGG lasers and are much more effective in most dental procedures.^{1,5} Er:YAG lasers have proved beneficial in the removal of granulation tissue and calculus and are an effective tool in periodontal therapy.⁴

Treatment with Nd:YAG lasers is effective for connective tissue reattachment to cementum and periodontal regeneration.² The Nd:YAG wavelength is able to kill the bacteria that are a part of the pathogenesis of periodontal disease.³ The combination of the two wavelengths in a single treatment makes optimum use of the unique laser-tissue interaction characteristics of each wavelength.

Nd:YAG laser energy is superior for coagulation and deep disinfection, while Er:YAG is uniquely efficient at gently removing the infected tissue and calculus from the root surface, along with its bactericidal effects. Combined, they can dramatically improve the outcome of laser-assisted treatments.

Case study

Patients who consented to treatment during this case study ranged from 40 to 80 years of age. The patients were not specifically selected, but represented the population typically treated in the office, made up of approximately 75 percent adults.

These patients had a variety of preexisting health conditions, including high blood pressure, diabetes and coronary artery disease.



Fig. 1: Case 1 during treatment. Photos/Provided by Dr. Harvey S. Shiffman



Fig. 2: Case 1 pre-operative X-ray.



Fig. 3: Case 1 post-operative X-ray at five months.

Cases varied from single pockets to full-mouth treatments. Patients had pocketing ranging from 2 to 10 mm with moderate to severe horizontal and angular bone loss.

Pockets 6 mm deep had collagen placed while those more than 6 mm had Novabone™ (Novabone Products) placed with a liquid Atrisorb™ (Zila) membrane and sealed with Periacyrl™ (Glustitch). Occlusal discrepancies were addressed in all cases, and full-mouth cases had full coverage orthotic appliances fabricated (Glidewell Comfort hard/soft). Patients were instructed to avoid brushing or flossing the area treated and avoid granular foods such as strawberries, poppy seeds and sesame seeds, etc., for one week. Patients were given Peridex™ (3M ESPE) rinse and doxycycline 100 mg for seven days.

Follow-up appointments occurred at one and two weeks post-treatment for removal of Periacyrl™ and biostimulation. In addition, de-epithelializing the pockets was completed based on the initial pocket depth during these one- and/or two-week follow-up appointments. Patients were brought back for periodontal maintenance after two months.

At all follow-up appointments, there were limitations on sub-gingival scaling. No probing was permitted for a minimum of six months to avoid damage to the new attachment.

Case No. 1

A 74-year-old female presented with no known allergies. The patient had no history of significant medical conditions or habits and was taking no medications at the time of treatment. The patient had a Class I occlusion with significant crowding. Her chief complaint was her swollen and bleeding gums. She presented with a 7 mm pocket on the mesial buccal of #7, 6 mm on the direct lingual and 6 mm on the distal lingual. Pre-operative radiographs showed a significant osseous defect.

Eight months after "wavelength optimized periodontal therapy" (WPT) treatment, probings were 2 mm in the previous locations; and after one year, they were consistent at 2 mm, which was a gain of 4 to 5 mm of attachment. Post-operative radiographs showed significant bone fill of the previous defect.

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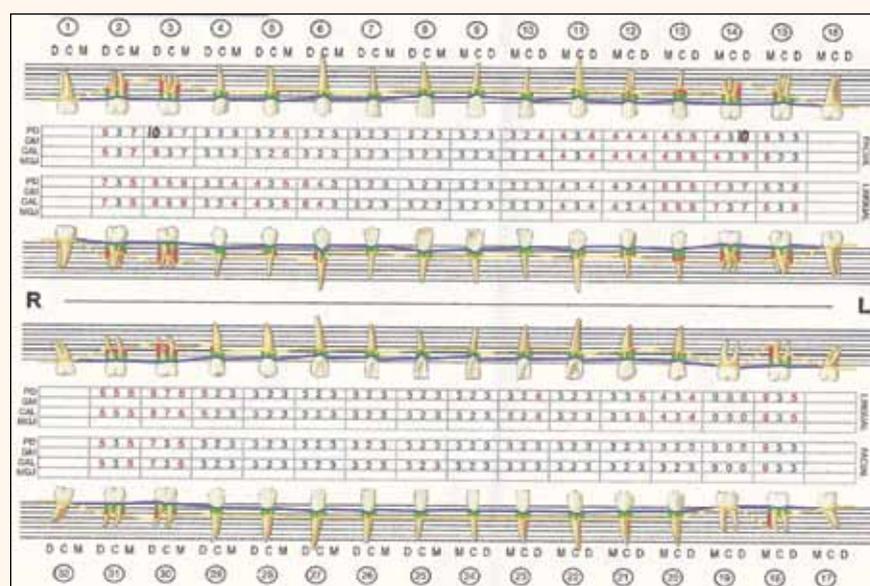


Fig. 4: Case 2 pre-operative probings.

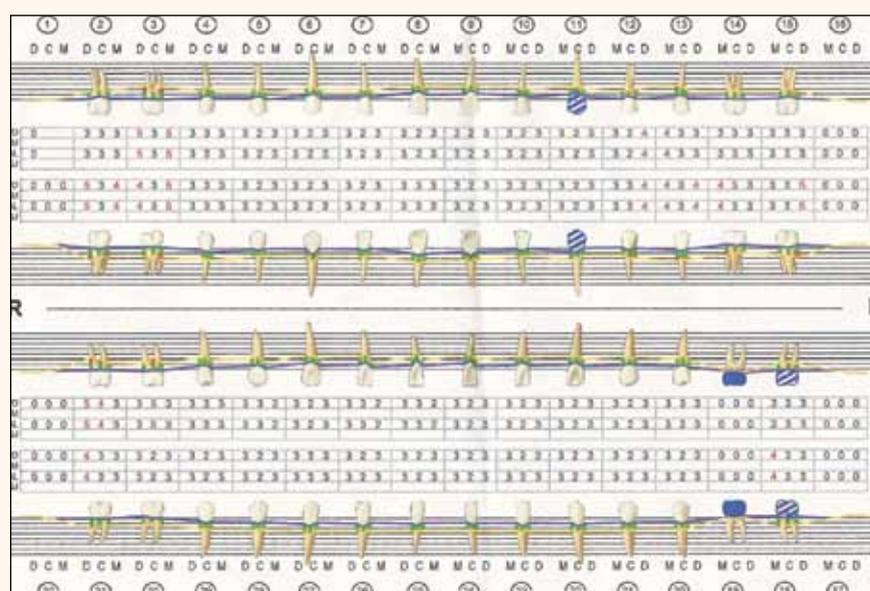


Fig. 5: Case 2 post-operative probings at 22 months.

Case No. 2

This 62-year-old male patient had a full-mouth case with pocketing ranging from 2 to 10 mm in multiple locations. The patient reported no known allergies and was taking prescription medications that included Metoprolol, Crestor, Ramipril and HCTZ. The patient's chief complaint was his bleeding and painful gums. The diagnosis was moderate to severe periodontal disease in all four quadrants and he consented to treatment.

Two-year postoperative probings and radiographs showed significant pocket reduction, reattachment and osseous fill in defects. Unfortunately, Dentrix periodontal charting only goes to 9 mm so the charts were modified for 10 mm pockets as needed. Pre-operative pocketing (Fig. 4) was as high as 10 mm in two locations. Figure 5 shows significant improvement at the 22-month post-operative follow up.

► See DUAL, page A8

◀ DUAL, page A7

The upper right 7 to 10 mm pockets regained 5 mm of attachment and bone fill; the upper left segments regained 4 to 7 mm; the lower left regained 5 to 6 mm; the lower right regained 3 to 5 mm.

Conclusion

Clinical, radiographic and probing evidence suggest that when followed correctly, WPT protocol is a strong and reliable tool for restoring periodontal health. However, it should be noted that occlusal considerations and orthotic appliances in full-mouth cases can have a great impact on outcomes. Patient maintenance and re-care can also dramatically affect the success of therapy.

The Lightwalker dual-wavelength laser has been proven to have strong benefits in periodontal therapy. Having the ability to offer patients a minimally invasive laser treatment with minimal bleeding, swelling and discomfort increases patient compliance and case acceptance versus traditional periodontal surgery. This seems to be especially true in patients who have had a history of traditional invasive periodontal surgery.

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Author disclosures

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Fig. 6: Case 2 pre-operative full-mouth X-ray.

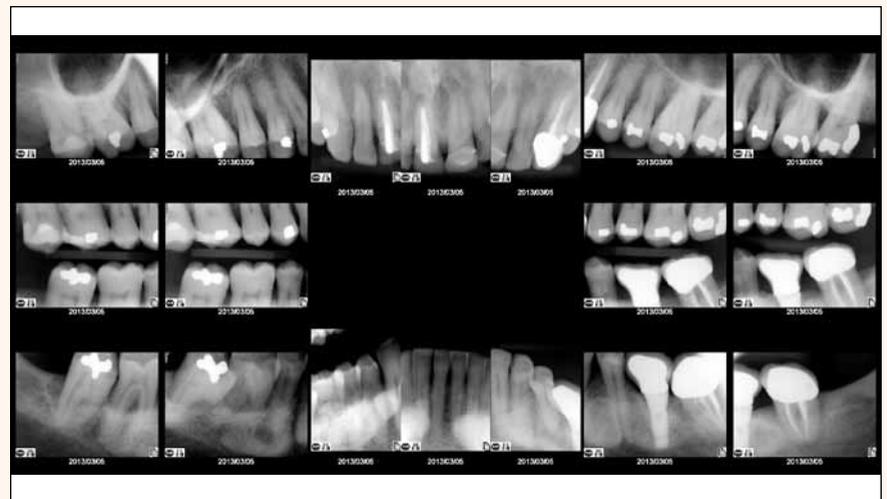


Fig. 7: Case 2 post-operative full-mouth X-ray.

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