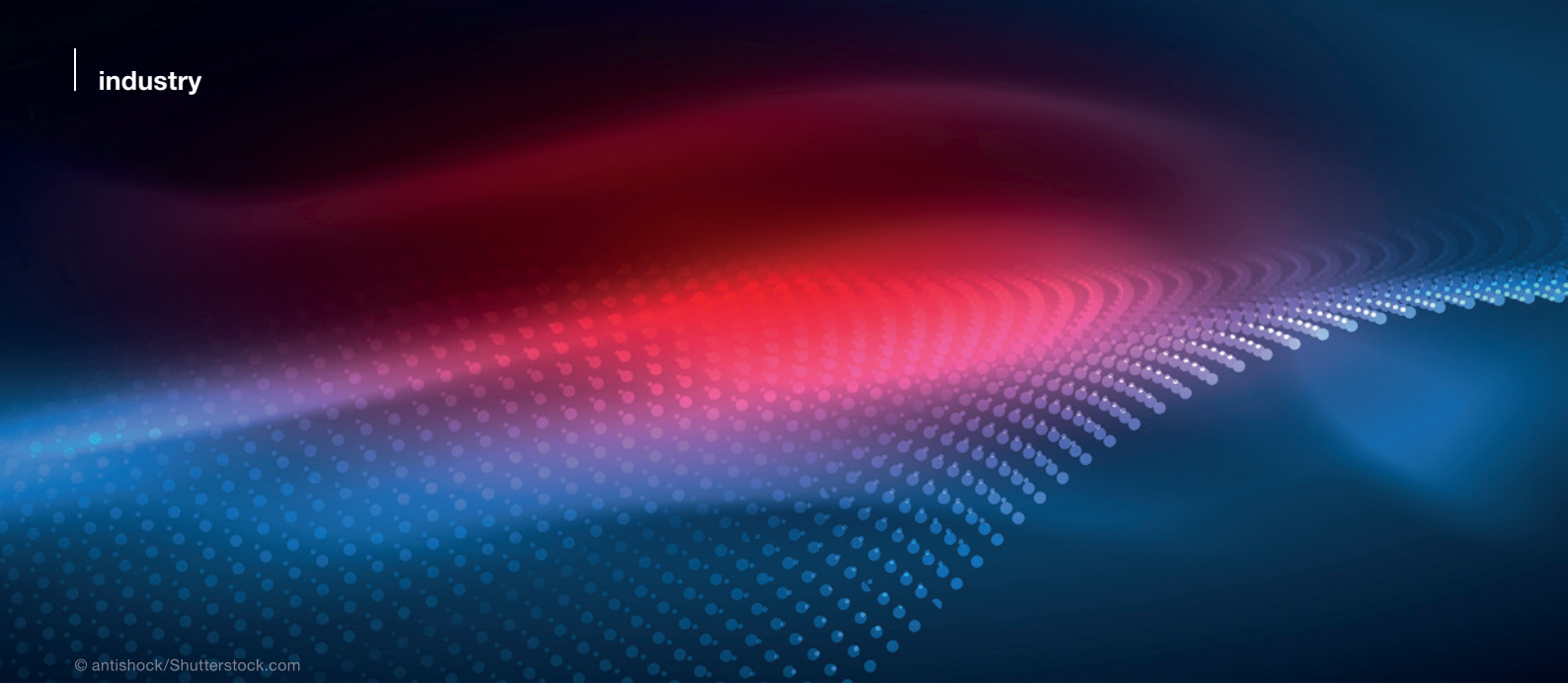


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Periodontal tissue regeneration

Dr Alan Dalessandro, Dr Harvey Shiffman, Dr Steven R. Pohlhaus & Dr Larry Lieberman, USA

Introduction

Periodontitis is a chronic inflammatory disease characterised by a progressive destruction of the supporting tissues of the tooth. This results in pathological lesions and may eventually lead to the loss of the tooth. Periodontitis is also associated with age-related chronic inflammatory diseases, affects general health and may increase the risk of stroke.

The primary goal of non-surgical periodontal treatment is to eliminate bacterial infection and slow down or preferably stop the progression of the inflammatory process. Because of their better access to deep pockets, furcations, and grooves, dental lasers have been considered for irradiation of periodontal pockets as an efficient alternative for non-surgical treatment. Various studies have also demonstrated the benefits of laser therapy, including biomodulatory, anti-infective, and ablation effects. Consequently, lasers today are used in the clinical nonsurgical treatment of periodontal disease, either as an adjunct or as an alternative to conventional mechanical instruments.

There are at least two nonsurgical laser periodontal procedures which have been extensively researched and have as a result gained relatively broad clinical acceptance. The first technique involves sulcular debridement with Nd:YAG laser, which helps achieve new connective tissue attachment and regeneration of the root surface. The second technique involves the use of Er:YAG laser, both as an alternative and an adjunct to mechanical therapy for subgingival calculus removal in nonsurgical pocket therapy SRP. Surgical debridement with an Er:YAG laser not only facilitates the debridement procedure in flap surgery but also may be advantageous for tissue repair and regeneration.

Based on the published favourable clinical outcomes of each of the laser treatments, i.e. Er:YAG and Nd:YAG, a combined dual-wavelength procedure called TwinLight® (also known as WPT™) has been introduced, which utilises the complementary beneficial effects of both laser wavelengths to further improve the clinical outcome of laser-assisted nonsurgical periodontal treatments. Periodontal tissue regeneration, which is considered to be the ultimate form of periodontal healing, has been demonstrated to be promoted individually with either Nd:YAG laser or Er:YAG laser being used as an adjunct to mechanical therapy. It is therefore to be expected that the TwinLight® procedure with the best of both periodontal laser treatment effects should result in at least as much, if not significantly greater promotion of periodontal tissue regeneration.

The aim of this four-center retrospective study was to provide clinical evidence of periodontal tissue regeneration when following the TwinLight® procedure, by conducting a retrospective case series analysis of available before and after radiographic images of patients receiving TwinLight® periodontal treatment, as collected during the past approximately six years.

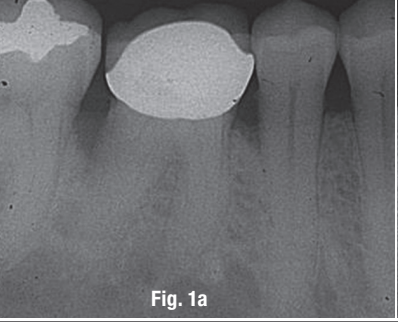

Fig. 1a


Fig. 1b


Fig. 2a


Fig. 2b


Fig. 3a

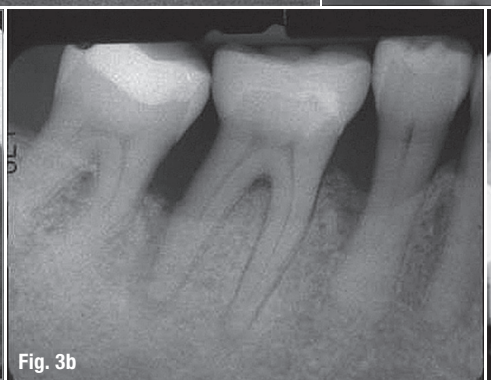

Fig. 3b


Fig. 4a


Fig. 4b

Figs. 1a & b: Patient #1 before **(a)** and six months following TwinLight® treatment **(b)**. **Figs. 2a & b:** Patient #2 before **(a)** and six months following TwinLight® treatment **(b)**. **Figs. 3a & b:** Patient #3 before **(a)** and nine months following TwinLight® treatment **(b)**. **Figs. 4a & b:** Patient #4 before **(a)** and 12 months following TwinLight® treatment **(b)**. (*Source: Dalessandro Implants and Periodontics)*

Materials and methods

Patients were given the TwinLight® dual Nd:YAG/Er:YAG laser periodontal treatment using a LightWalker/Powerlase laser (manufactured by Fotona).

The TwinLight® procedure consists of the following three steps:

1st step: De-epithelialization and decontamination

Perform Nd:YAG laser sulcular debridement. Initiate Nd:YAG laser treatment of the inner pocket wall to remove the pocket epithelium around the entire tooth (2–4 Watts to the tissue, SP or MSP mode, 10–20 Hz). Nd:YAG handpiece strokes from side to side. Denature the inner pocket epithelium to the depth of the probe readings. Remove the denatured tissue as it collects on the fiber ending.

2nd step: Calculus removal (debriding refinishing)

Perform Er:YAG laser root debridement (removal of the subgingival calculi) with a 600 µm VARIAN tip, 100–200 mJ, 10–20 Hz, QSP, SSP or MSP pulse duration. Handpiece strokes are up and down. Perform mechanical scaling and root planning with a piezoelectric or ultrasonic scaler. Biofilm removal with Er:YAG laser using an XPulse, PIPS or VARIAN 400–600 µm fiber tip, 20–50 mJ, 20–40 Hz, SSP or MSP pulse duration. Handpiece surface movement.

3rd step: Clot formation

Lase the pocket contents of the teeth (3–4 Watts to the tissue, VLP mode, 20 Hz) to help coagulate any blood present and to form a pocket seal. Activate the Nd:YAG laser on the out-stroke only. Approximate the wound edges. Compress the tissue with wet gauze against the tooth from both a facial and lingual direction. Eliminate all occlusal interference. Prescribe medications for home use.

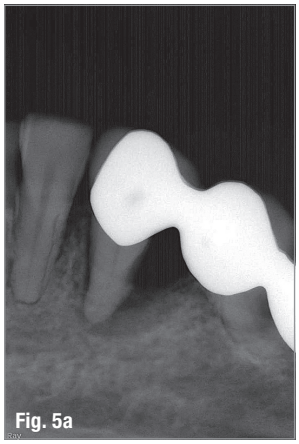
Results

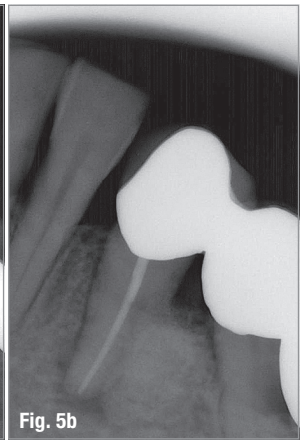
Four private dental practices were involved in the retrospective collection and analysis of before and after radiographic images of their patients receiving the TwinLight® periodontal treatments, as collected during the period of approximately the past six years.

The figures below show the case series' radiograph images demonstrating periodontal tissue regeneration following TwinLight® Nd:YAG/Er:YAG treatment (Figs. 1–6).

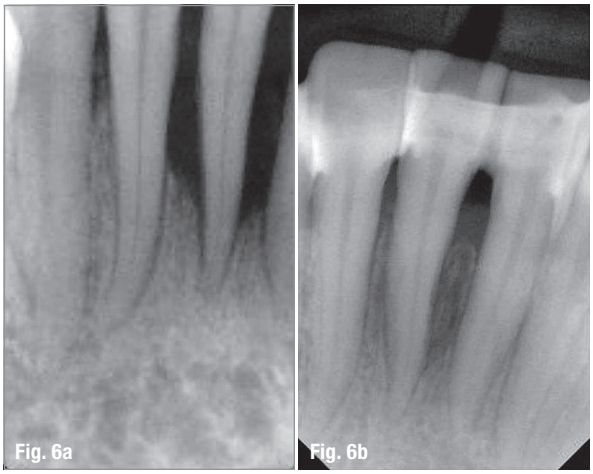
Discussion

Due to the complementary effects of the near-infrared (Nd:YAG: 1,064 nm) and medium-infrared (Er:YAG:


Fig. 5a


Fig. 5b

Figs. 5a & b: Patient #5 before **(a)** and 22 months following TwinLight® treatment **(b)**. *(Source: Boynton Laser Dental Center)*



Figs. 6a & b: Patient #6 before **(a)** and following TwinLight® treatment **(b)**. (*Source: Baltimore Center for Laser Dentistry)*

2,940 nm) laser wavelengths, the TwinLight® dual-wavelength procedure synergistically combines the individual effects of both wavelengths for a better resolution or control of some aspect of the periodontal disease, such as bacterial load, inflamed tissue or tartar, and thus promises to result in a more effective adjunct to conventional periodontal therapy (SRP).

Conclusions

Data presented in this study reveals the ability of the combined TwinLight® Nd:YAG and Er:YAG laser treatment of chronic periodontitis to promote bone regeneration. In conjunction with published microbiological results, the nonsurgical TwinLight® periodontal treatment with Nd:YAG and Er:YAG laser thus promises to become a preferred alternative treatment for moderate to severe chronic periodontitis.

Further long-term, randomized, controlled clinical trials are needed to quantify the contribution of each of the TwinLight® laser wavelengths and of their combined, potentially synergistic effect on the clinically observed regeneration of periodontal tissues.

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Kurz & bündig

Die Behandlung von chronischer Parodontitis mithilfe des Nd:YAG- oder des Er:YAG-Lasers wurde bereits umfassend erforscht. Auf Basis der veröffentlichten klinischen Ergebnisse der einzelnen Laserbehandlungen wurde eine kombinierte Dual-Wellenlängen-Methode initiiert, genannt TwinLight®, welche die komplementären positiven Effekte beider Laserwellenlängen nutzt. Parodontale Geweberegeneration, als optimale Heilungsform von Parodontitis, wurde sowohl durch den Einsatz des Nd:YAG-Lasers als auch des Er:YAG-Lasers gefördert. Es wird daher angenommen, dass die TwinLight®-Methode, welche beide gezielt kombiniert, mindestens genauso effektiv, wenn nicht bedeutend erfolgreicher in der Förderung der parodontalen Geweberegenerierung sei.

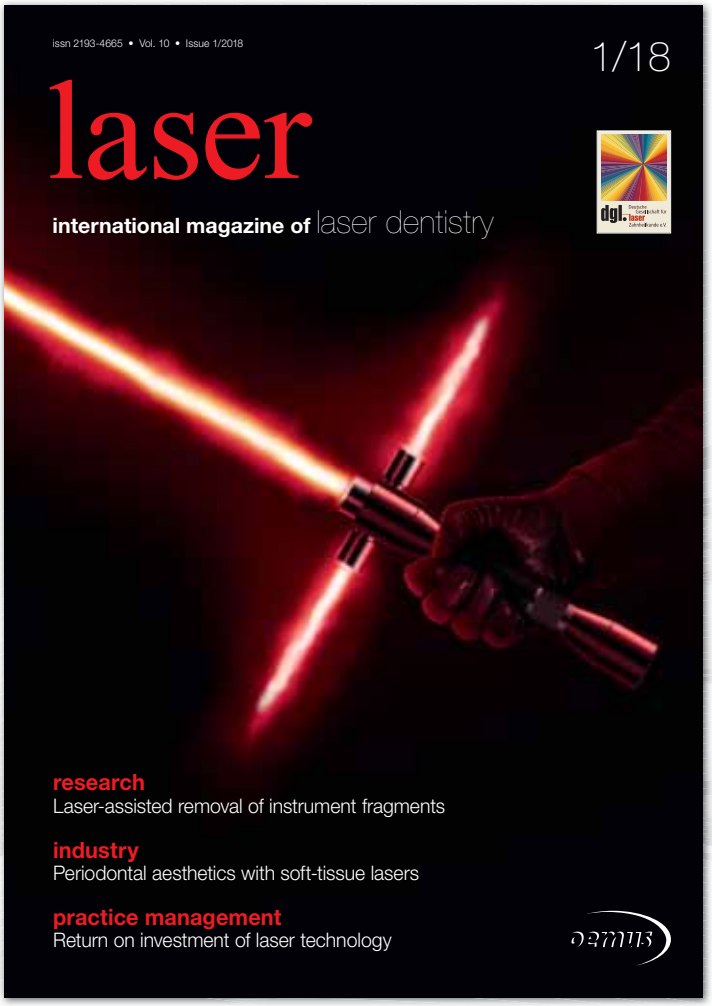
Um diese Optionen genauer zu untersuchen, wurden retrospektiv Daten von vier privaten Zahnarztpraxen der letzten circa sechs Jahre analysiert und ausgewertet. Am Beispiel von sechs ausgewählten Patientenfällen der beteiligten Praxen sind anhand von Röntgenaufnahmen einerseits der Ausgangszustand sowie jeweils im Vergleich der erreichte Gewebebildungseffekt nach der Behandlung mit der TwinLight®-Methode dargestellt. Diese erfolgt jeweils in drei Stufen. Die ausgewerteten Daten bestätigen die Möglichkeit der gesteigerten Knochenregeneration durch die kombinierte TwinLight® Nd:YAG- und Er:YAG-Laserbehandlung in Fällen von chronischer Parodontitis. Die individuellen Effekte beider Wellenlängen verbinden sich synergetisch. Somit werden bestimmte Aspekte der Parodontitis kontrollierbarer und es sind folglich vielversprechendere Resultate zu erwarten als bei der konventionellen Parodontaltherapie.

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