Immunohistochemical characterization of periodontal wound healing following nonsurgical treatment with fluorescence controlled Er:YAG laser radiation in dogs.

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BACKGROUND AND OBJECTIVE: The aim of the present study was to immunohistochemically characterize periodontal wound healing following nonsurgical treatment with fluorescence controlled Er:YAG laser radiation in dogs.

STUDY DESIGN/MATERIALS AND METHODS: Five beagle dogs suffering from naturally occurring chronic periodontitis were randomly allocated in a split-mouth design to nonsurgical periodontal treatment using either (a) an Er:YAG laser at 10.2, 12.8, 15.4, 18, and 20.4 J/cm² (ERL1-5), or (b) an ultrasonic device (VUS) serving as control. The animals were sacrificed after 3 months. Histomorphometrical (e.g. inflammatory cell infiltrate, surface changes, cementum formation), and immunohistochemical parameters (collagen type I, CD68, matrix metalloproteinase (MMP)-8) were assessed.

RESULTS: Inflammatory cell infiltrates of different extent were commonly observed in all treatment groups. However, histomorphometrical analysis revealed new cementum formation with inserting collagen type I fibers along the instrumented root surfaces in most specimens of both ERL (ERL2: 31+/−81 to ERL5: 595+/−575 microm) and VUS (50+/− 215 microm) groups. This was associated with pronounced CD68 and weak MMP-8 antigen reactivity.

CONCLUSION: Within the limits of the present study, it was concluded that both treatment procedures (i) were effective in controlling inflammatory cell infiltrates, and (ii) may support the formation of a new connective tissue attachment. (c) 2007 Wiley-Liss, Inc.

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Clinical and histological healing pattern of peri-implantitis lesions following non-surgical treatment with an Er:YAG laser.

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BACKGROUND AND OBJECTIVES: The aim of the present study was to assess clinical and histopathological healing pattern of peri-implantitis lesions following non-surgical treatment with an Er:YAG laser (ERL).

STUDY DESIGN/MATERIALS AND METHODS: Twelve patients suffering from peri-implantitis (n = 12 implants) received a single episode of non-surgical instrumentation using ERL (12.7 J/cm²). Assessment of clinical parameters (plaque index (PI), bleeding on probing (BOP), probing pocket depth, gingival recession (GR), and clinical attachment level (CAL)), surgical defect examination, and histo-pathological examination of peri-implant tissue biopsies was performed after 1, 3, 6, 9, 12, and 24 months.

RESULTS: All patients exhibited improvements of all clinical parameters investigated. However, histo-pathological examination of tissue biopsies revealed a mixed chronic inflammatory cell infiltrate (macrophages, lymphocytes, and plasma cells) which seemed to be encapsulated by deposition of irregular bundles of fibrous connective tissue showing increased proliferation of vascular structures.

CONCLUSION: It was concluded that a single course of non-surgical treatment of peri-implantitis using ERL may not be sufficient for the maintenance of failing implants. Copyright 2006 Wiley-Liss, Inc.

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Influence of an erbium, chromium-doped yttrium, scandium, gallium, and garnet (Er,Cr:YSGG) laser on the reestablishment of the biocompatibility of contaminated titanium implant surfaces

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BACKGROUND: The aim of the present study was to evaluate the influence of an erbium, chromium-doped yttrium, scandium, gallium, and garnet (Er,Cr:YSGG laser [ERCL]) on 1) the surface structure and biocompatibility of titanium implants and 2) the removal of plaque biofilms and reestablishment of the biocompatibility of contaminated titanium surfaces.

METHODS: Intraoral splints were used to collect an in vivo supragingival biofilm on sand-blasted and acid-etched titanium disks for 24 hours. ERCL was used at an energy output of 0.5, 1.0, 1.5, 2.0, and 2.5 W for the irradiation of 1) non-contaminated (20 and 25 Hz) and 2) plaque-contaminated (25 Hz) titanium disks. Unworn and untreated non-irradiated, sterile titanium disks served as untreated controls (UC). Specimens were incubated with SaOs-2 osteoblasts for 6 days. Treatment time, residual plaque biofilm (RPB) areas (%), mitochondrial cell activity (MA) (counts per second), and cell morphology/surface changes (scanning electron microscopy [SEM]) were assessed.

RESULTS: 1) ERCL using either 0.5, 1.0, 1.5, 2.0, or 2.5 W at both 20 and 25 Hz resulted in comparable mean MA values as measured in the UC group. A monolayer of flattened SaOs-2 cells showing complete cytoplasmatic extensions and lamellopodia was observed in both ERCL and UC groups. 2) Mean RPB areas decreased significantly with increasing energy settings (53.8 +/- 2.2 at 0.5 W to 9.8 +/- 6.2 at 2.5 W). However, mean MA values were significantly higher in the UC group.

CONCLUSION: Within the limits of the present study, it was concluded that even though ERCL exhibited a high efficiency to remove plaque biofilms in an energy-dependent manner, it failed to reestablish the biocompatibility of contaminated titanium surfaces.
An evaluation of the effects of an Nd:YAG laser on subgingival calculus, dentine and cementum
An in vitro study

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Abstract

The aim of this study was to evaluate the effects of Nd:YAG laser treatment on subgingival calculus, cementum and dentine, in vitro at different power settings and durations. The study included 2 experiments. In the 1st experiment, 32 extracted teeth with calculus were divided into 8 laser treatment groups. Each tooth was treated on 2, 3 or 4 sites. In the 2nd experiment, 3
extracted cementum covered teeth and 3 extracted root planed teeth with exposed dentine were selected. 1 surface of each tooth was subjected to 8 different laser treatments. In both experiments, all specimens were assessed using scanning electron microscopy. Micrographs were taken from each treated site at X100 and X750 magnifications. An arbitrary scale (from 0 to 3) was used to score the degree of damage caused by the laser. Generally, the laser caused greater damage on calculus than either cementum or dentine. Linear regression analysis showed that higher total energy input caused a greater mean damage score on calculus (R2 = 66%, p<0.001). 3-way analysis of variance showed that for calculus, the power setting, number of pulses per second and the duration of exposure contributed independently to the mean damage score in an additive way. Cementum specimens were not affected by treatment 1 (50 mJ. 10 pps, 1 s). treatment 2 (50 mJ, 10 pps, 5 s), and treatment 5 (50 mJ, 20 pps, 1 s). Dentine specimens were not affected by treatment 1 (50 mJ, 10 pps, 1 s). The results also showed that there was variability in susceptibility of different teeth and different parts of each tooth which was true for calculus, cementum and dentine.

Clinical parameters were measured at baseline, 3 and 6 months after treatment by one blinded and calibrated examiner: Plaque index (PI), bleeding on probing (BOP), probing depth (PD), gingival recession (GR) and clinical attachment level (CAL). At the baseline examination, there were no statistically significant differences in any of the investigated parameters. Mean value of BOP decreased in the ERL group from 83% at baseline to 31% after 6 months (P < 0.001) and in the C group from 80% at baseline to 58% after 6 months (P < 0.001). The difference between the two groups was statistically significant (P < 0.001, respectively). The sites treated with ERL demonstrated a mean CAL change from 5.8 +/- 1 mm at baseline to 5.1 +/- 1.1 mm (P < 0.01) after 6 months. The C sites demonstrated a mean CAL change from 6.2 +/- 1.5 mm at baseline to 5.6 +/- 1.6 mm (P < 0.001) after 6 months. After 6 months, the difference between the two groups was statistically not significant (P > 0.05). Within the limits of the present study, it was concluded that (i) at 6 months following treatment both therapies led to significant improvements of the investigated clinical parameters, and (ii) ERL resulted in a statistically significant higher reduction of BOP than C.
Treatment of periimplantitis with laser or ultrasound. A review of the literature

[Article in German]

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In addition to conventional treatment modalities (mechanical and chemical), the use of different lasers has been increasingly proposed for the treatment of peri-implantitis. Results from both controlled clinical and basic studies have pointed to the high potential of an Er:YAG-laser. Its excellent ability to effectively ablate dental calculus without producing major thermal side-effects to adjacent tissue has been demonstrated in numerous studies. Recently, a new ultrasonic device has been used for the treatment of periodontal and peri-implantitis infections. Preliminary clinical data indicate that treatment with both treatment procedures may positively influence peri-implant healing. The aim of the present review paper is to evaluate, based on the available evidence, the use of an Er:YAG-laser and a newly introduced ultrasonic device for treatment of peri-implantitis in comparison to a conventional treatment approach.
Periodontal treatment with an Er:YAG laser or scaling and root planing. A 2-year follow-up split-mouth study.

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BACKGROUND: Non-surgical periodontal treatment with an Er:YAG laser has been shown to result in significant clinical attachment level gain; however, clinical results have not been established on a long-term basis following Er:YAG laser treatment. Therefore, the aim of the present study was to present the 2-year results following non-surgical periodontal treatment with an Er:YAG laser or scaling and root planing.

METHODS: Twenty patients with moderate to advanced periodontal destruction were treated under local anesthesia, and the quadrants were randomly allocated in a split-mouth design to either 1) Er:YAG laser (ERL) using an energy level of 160 mJ/pulse and 10 Hz, or 2) scaling and root planing (SRP) using hand instruments. The following clinical parameters were evaluated at baseline and at 1 and 2 years after treatment: plaque index (PI), gingival index (GI), bleeding on probing (BOP), probing depth (PD), gingival recession (GR), and clinical attachment level (CAL). Subgingival plaque samples were taken at each appointment and analyzed using dark-field microscopy for the presence of cocci, non-motile rods, motile rods, and spirochetes. The primary outcome variable was CAL. No statistically significant differences between the groups were found at baseline. Power analysis to determine superiority of ERL treatment showed that the available sample size would yield 99% power to detect a 1 mm difference.

RESULTS: The sites treated with ERL demonstrated mean CAL change from 6.3 +/- 1.1 mm to 4.5 +/- 0.4 mm (P < 0.001) and to 4.9 +/- 0.4 mm (P < 0.001) at 1 and 2 years, respectively. No statistically significant differences were found between the CAL mean at 1 and 2 years postoperatively. The sites treated with SRP showed a mean CAL change from 6.5 +/- 1.0 mm to 5.6 +/- 0.4 mm (P < 0.001) and to 5.8 +/- 0.4 mm (P < 0.001) at 1 and 2 years, respectively. The CAL change between 1 and 2 years did not present statistically significant differences. Both groups showed a significant increase of cocci and non-motile rods and a decrease in the amount of spirochetes. However, at the 1- and 2-year examination, the statistical analysis showed a significant difference for the CAL (P < 0.001, respectively) between the 2 treatment groups.

CONCLUSION: It was concluded that the CAL gain obtained following non-surgical periodontal treatment with ERL or SRP can be maintained over a 2-year period.

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