Er:YAG Laser in the Clinical Management of Severe Peri-implantitis: A Case Report

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Peri-implantitis is bacterial infections of peri-implant supporting tissues, involving the peri-implant bone. Several treatment protocols have been tested in clinical practice with variable efficacy. The clinical management of peri-implantitis aims for elimination of plaque and calculus, decontamination of the failing implant surface, and regeneration of lost bone tissue. Surface decontamination is an important part of all suggested treatments. This can be accomplished with the use of chemical agents (eg, chlorhexidine) or mechanical (eg, ultrasonic) or photonic (eg, laser) devices. In this report, we present a case of severe peri-implantitis that was successfully managed with a combined nonsurgical and surgical approach. Implant surface debridement/decontamination of the implant surface was achieved with an erbium-doped yttrium aluminium garnet (Er:YAG) laser device.

Key Words: peri-implantitis, laser, Er:YAG, implantology, periodontology

INTRODUCTION

Oral implantology is a continuously growing discipline in everyday dental practice. With the increasing number of delivered dental implants (DIs), a high incidence of peri-implant infection is likely to occur. Peri-implantitis (PI) is an infection of the implant surrounding tissues that involves the peri-implant bone. Clinical manifestations of PI include visible signs of mucosal inflammation, pocket formation with bleeding on probing (±suppuration) and bone resorption.1 The latter usually occurs in a crater-like shape around ailing implants. The cause of PI is by far similar to that of periodontitis. In fact, bacterial biofilms, mainly anaerobic, are responsible for the initiation and progression of peri-implant infection.2 Few studies have tried to evaluate the prevalence of PI. The data recovered from these studies indicate that PI occurs in 12%–43% of DI sites.3 In view of these results, efficient treatment modalities for PI are needed. Until now, different therapeutic strategies have been described for the clinical management of PI, without proven superiority of any of these strategies. The latter are inspired by periodontitis treatment protocols. Thus, the management of PI consists of establishing a rigorous daily hygiene and performing
mechanical debridement of the contaminated implant surface (IS) (± antisepsics/antibiotic adjuncts). Regenerative procedures are also performed to establish bone regeneration (± reosseointegration).\textsuperscript{4} Most proposed protocols include the decontamination of the IS in conjunction with efficient daily plaque control.

Many preclinical and clinical studies have reported the possibility of using the Er:YAG laser (ERL) for debridement/decontamination of IS.\textsuperscript{5–8} Dental lasers are thought to have efficient capability for decontaminating the IS.\textsuperscript{9,10} Because lasers use unidirectional light beams, it should be assumed that they gain better access to all parts of the IS, compared with manual curettes or ultrasonic tips, which could not reach all parts of screw-type implants.\textsuperscript{11} In addition, ERL beams used with the recommended energy range do not cause major detrimental alterations of the IS.\textsuperscript{12} ERL devices produce light beams with a wavelength of 2.94 μm. This wavelength makes this laser suitable for calculus elimination and bacterial decontamination.

In this article, we report a severe case of PI that was treated by a therapeutic approach that combined ultrasonic and ERL debridement/decontamination.

**Patient Presentation**

A 70-year-old female consulted staff for implant maintenance. Patient history revealed no particular medical risk for dental care. At the clinical examination, the patient was totally edentulous at the mandible and partially at the maxillary. An implant-supported metallic bar enhanced the retention of a mandibular prosthesis that had been delivered 10 years earlier. Four implants in the anterior region supported the metallic bar. The patient complained of suppurative around the posterior left implant (PLI) (Figure 1). At the time of the initial consultation, she had already been on an antibiotic regimen for 1 week (spiramycin + metronidazole, Birodogyl). Also, the patient had continuously worn her prosthesis.

Clinical examination revealed inflamed mucosa around the PLI, deep peri-implant pockets (5–9 mm) and bleeding on probing (BoP) (Figure 5A). Suppuration was also present on the distal surface of the PLI. Occlusal examination showed equilibrated occlusal contacts on the mandibular overdenture and failed to reveal any traumatic interference or overload. In fact, the overdenture had equilibrated balanced occlusion with the upper one. Thus, the mandibular prosthesis was not modified. The patient had excellent motivation but had not received proper instruction concerning plaque control techniques.

**Treatment**

A 2-stage treatment plan was decided. The first stage consisted of oral hygiene instructions, an antiseptic prescription (2 weeks, chlorhexidine 0.1%, 3 times/day; Eludril, Pierre Fabre Oral Care, Castres-Chartreuse, France), ultrasonic scaling (special Teflon tip; Sonicflex, KaVo, Bieberach, Germany), and nonsurgical laser debridement (LD) (Figure 2). An ERL with a special beveled tip (Laser Key 3, KaVo) was used for irradiation (Figure 2C) (energy, 120 mJ; frequency, 10 Hz; sterile water irrigation). Each site was ERL irradiated for 60 seconds, with a 10 to 15 degree working angulation 6 weeks after initial nonsurgical therapy; a visible reduction in mucosal swelling was observed. Probing showed no suppuration; mild bleeding and substantial reduction of pocket depth (PD) (2–5 mm reduction) occurred (Figure 5B).

The second stage of treatment was decided as follows: A surgical ultrasonic/laser debridement (using the settings stated above) was performed. Thus, after peri-implant intrasulcular incisions were made, a full-thickness access flap was elevated. This
FIGURES 1 AND 2. **FIGURE 1.** Initial examination. (a) Swelling and bleeding on probing around the left posterior implant. (b) Peri-implant bone loss involving more than 50% of the implant length. **FIGURE 2.** Nonsurgical scaling and debridement of failing implant. (a) Ultrasonic Teflon tip used for mechanical scaling and implant debridement. (b) Erbium-doped yttrium aluminium garnet (Er:YAG) laser debridement/decontamination of the subgingival implant surface. (c) Special beveled tip delivering direct and angulated laser beams.
permitted visual and instrumentation access to all exposed threads. After thorough debridement of the IS, granulation tissue was eliminated from the bony defect using bone curettes. Synthetic bone substitute (biphasic calcium phosphate, BCP, Biomatlante, Nantes, France) was used to fill the crater-shaped bony defect (Figure 3).

Three months after surgery, probing results showed no bleeding and further reduction of PD (0–2 mm). The patient had maintained satisfactory oral hygiene.

Six months after surgery, radiologic examination revealed bone formation around the PLI and disappearance of the crater-like defect. Mild gingival recession had also occurred (1–2 mm reduction) (Figure 4).

**CONCLUSION**

This case shows the possibility of successfully treating severe PI. In this particular case, 2 factors played a crucial part in the final outcome: patient motivation and biomechanical conditions with the metallic bar stabilizing the implant. An efficient oral hygiene regimen and the absence of traumatic jiggling forces on the implant are...
prerequisites for the management of PI. On the other hand, nonsurgical treatment with ultrasound scaling and laser debridement failed to establish acceptable healing, despite PD and bleeding reduction. This result is consistent with previous data indicating that the nonsurgical approach in the management of PI may not be sufficient.\(^4,13\) An access flap permitted successful ERL debridement and decontamination of the exposed IS. This is confirmed by the clinical indices and the newly formed bone, as shown on radiologic examination. BCP bone substitute was used only for its osteoconductive properties.\(^4\) Thus, BCP substitutes are defect fillers that act as scaffolds for bone healing and regeneration.

After the last reevaluation (at 6 months’ follow-up), the patient was included in an implant maintenance program. Continuous recall visits are scheduled for peri-implant probing and prophylactic implant scaling.

**Abbreviations**

BCP: biphasic calcium phosphate  
BoP: bleeding on probing  
DI: dental implant  
ERL: Er:YAG laser  
Er:YAG: erbium-doped yttrium aluminium garnet  
IS: implant surface  
LD: laser debridement  
PD: pocket depth  
PI: peri-implantitis  
PLI: posterior left implant

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**References**


