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Case Report

Non-surgical treatment of peri-implantitis with the adjunctive use of an 810-nm diode laser

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Abstract:

An 810-nm diode laser was used to non-surgically treat a 7-mm pocket around an implant that had five threads of bone loss, BoP+, and exudate, and the patient was followed up for 5 years. Non-surgical treatment, home care reinforcement, clinical indices records, and radiographic examination were completed in two consecutive 1-h appointments within 24 h. The patient was monitored frequently for the first 3 months. Subsequently, maintenance debridement visits were scheduled at 3-month intervals. The patient had a decreased probing pocket depth and a negative BoP index compared to initial clinical data, and the results were stable after 1 year. After 5 years of follow-up visits, there appeared to be rebound of the bone level radiographically. Within the limits of this case report, conventional non-surgical periodontal therapy with the adjunctive use of an 810-nm diode laser may be a feasible alternative approach for the management of peri-implantitis. The 5-year clinical and radiographic outcomes indicated maintenance of the clinical improvement.

Key words:

Diode laser, inflammation, non-surgical periodontal treatment, peri-implantitis, periodontal maintenance

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INTRODUCTION

Peri-implantitis is inflammation of the peri-implant supporting tissue, which can lead to progressive loss of supporting bone, if untreated.[1]

A history of periodontitis, poor oral hygiene, and smoking are considered risk factors for peri-implant diseases.[2] It is of paramount importance to treat periodontitis of the residual dentition prior to implant placement. A higher implant failure rate and elevated number of sites with peri-implant bone loss were documented in periodontally compromised patients who did not adhere to comprehensive supportive periodontal therapy. Customized and correctly performed supportive periodontal therapy is essential to enhance the long-term outcome of implant therapy.[2]

The outcome of non-surgical periodontal treatment (NSPT) of peri-implantitis is unpredictable. Although minor beneficial effects of laser therapy on peri-implantitis have been shown, this method requires further evaluation.[2]

The diode laser is not an ablative instrument and can directly contact the implant surfaces without inducing melting, cracking, or crater formation.[3] The 810-nm diode laser, when used in accordance with appropriate parameters, does not damage titanium surfaces, which is useful when uncovering submerged implants,[4] and can be used to treat bacterial induced peri-implantitis.[4]

The use of laser treatment in periodontal therapy is an emerging therapeutic option, although little reliable evidence suggests that it can effectively treat peri-implantitis.[5]

CASE REPORT

A 45-year-old male presented with pain and swelling at a mandibular implant site (Nobel Biocare, SW). Clinical examination revealed a deep pocket [7-mm pocket depth (PD)] and bleeding on probing [Figure 1], with suppuration and gingival inflammatory edema at the implant site. The patient was in good general health, did not take any medications, and was an occasional smoker (4-5 cigarettes/day).

No occlusal trauma or parafunctional habits were detected.

A periapical radiograph demonstrated bone loss of five fixture threads on the most distal mandibular left implant, when compared to the original radiograph [Figure 2].

The patient was eventually scheduled for periodontal surgery to treat the inflammatory

lesion, but emergency intervention was indicated to disinfect the area by removing the bacterial biofilm and alleviating pain using an 810-nm diode laser [Figure 3]. No local anesthesia or systemic antibiotics were administered.

The patient was asked to rinse with undiluted chlorhexidine 0.2% for 1 min. After insertion of the optical fiber parallel to the long axis of the implant 1 mm from the most apical portion of the pocket, the diode insert was moved in an apico-coronal and mesio-distal direction for 30 sec at each inflamed implant site. It was used at a power of 0.5 W in a continuous wave (cw) [equivalent to 1 W in pulsating mode (pw) for 30 s] in duplicate on each site, for a total time of 360 sec with a fluence of 1.96 J/cm^2.

Non-surgical periodontal instrumentation was performed with hand instrumentation using a titan curette (Roncati Implant Care, by Martin KLS) and a piezoelectric ultrasonic device with plastic fused to a metal insert (Piezon Master 700, EMS, PI insert), as needed. Finally, a 0.5% chlorhexidine gel was deposited into the sulcus with a disposable syringe and a blunt needle.

These procedures were repeated the following day.

The area was checked for plaque removal and home care compliance for the first month on a weekly basis and was followed by routine supportive periodontal therapy at 3-month intervals. The adjunctive use of the diode laser was included in the conventional periodontal maintenance every 6 months for the following 3 years.

Periodontal indices were documented and intraoral periapical radiographs were taken at the 1-year [Figure 4], and 2-, 3-, 4-, and 5-year [Figures 5 and 6] follow-up recall appointments.

Satisfactory results were obtained by the application of laser-assisted non-surgical peri-implant therapy. Periodontal pocket depth was reduced from 7 to 3 mm with no bleeding upon probing. Intraoral periapical radiographs, taken for up to 5 years post–non-surgical treatment, provide evidence of some improvement of the bone level. The reduction of periodontal pockets is probably due to re-epithelialization, with formation of a long junctional epithelial attachment.

Figure 1: Clinical examination revealed 7-mm probing depths, circumferentially around a mandibular implant, bleeding on probing, and the presence of exudate and gingival inflammatory edema

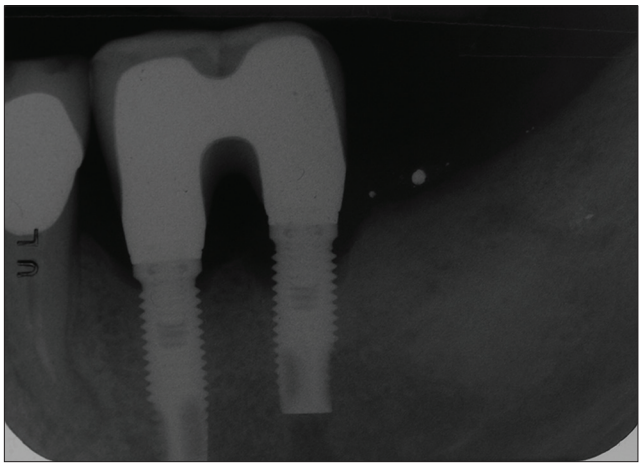

Figure 2: Periapical radiography shows bone loss for five fixture threads on the most distal mandibular left implant

Figure 3: The patient was treated using an 810-nm diode laser to disinfect the area and facilitate bacterial biofilm removal by mechanical and manual periodontal instrumentation

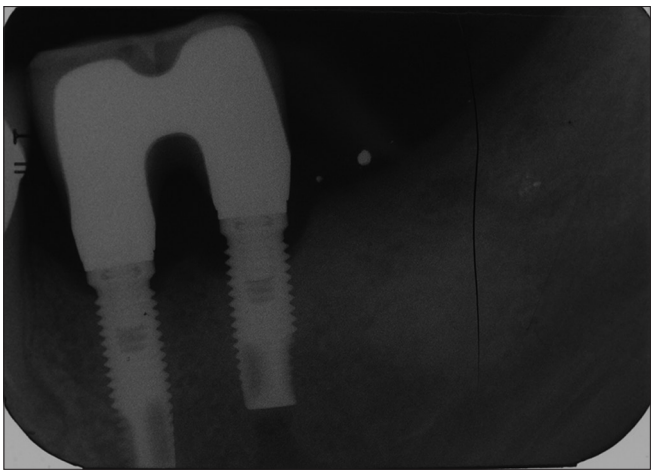

Figure 4: Periapical radiograph: 1-year post–non-surgical treatment

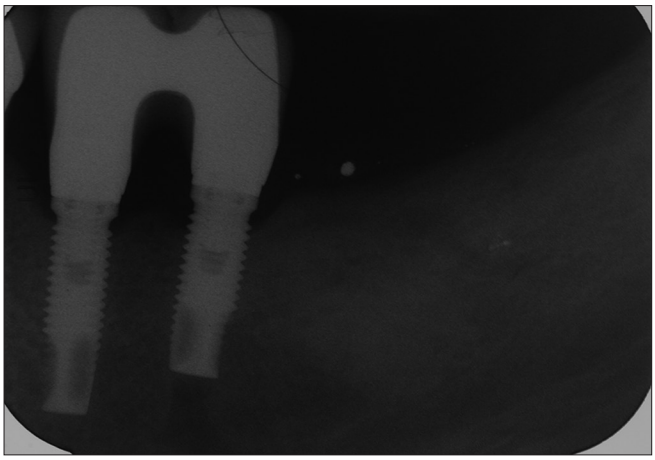

Figure 5: Periapical radiograph: 5-year follow-up

Figure 6: Clinical probing depth: 5-year follow-up

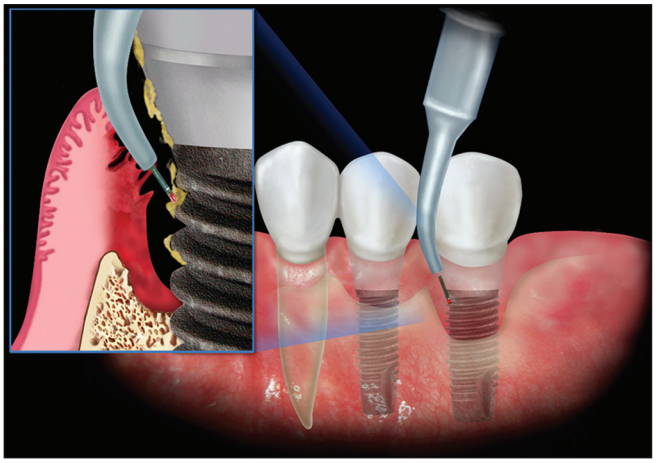

Figure 7: The diode laser has mainly bactericidal effect. Threaded implants have a different morphology than root surfaces; therefore, debridement instruments may differ. The laser may facilitate detoxification of the implant surface

DISCUSSION

At the 6th European Workshop on Periodontology, it was reported that mechanical non-surgical therapy with an adjunct of local antibiotics or laser application was effective longitudinally[2] to reduce bleeding on probing and PDs over a period of 6-12 months. However, the outcome is unpredictable due to possible re-infection related to the inability to completely remove bacterial deposits from titanium implant surfaces, thus interfering with new histological bone-to-implant contact.[6] The primary objective of non-surgical treatment for peri-implantitis is to remove bacterial contaminants to allow resolution of the inflammatory lesion.[2]

To date, no critical probing depths in the therapy of peri-implant diseases have been defined to guide selection of a non-surgical or surgical approach. Laser treatment may serve as an alternative or adjunctive treatment to conventional periodontal mechanical therapy or peri-implantitis.

Clinical application of lasers to treat periodontal disease is increasing, but remains controversial.

Diode lasers have a bactericidal effect due to a localized increase in temperature, which has been verified *in vivo* using DNA probes that detect periodontal pathogens.[7] Threaded implants have a different morphology than root surfaces; therefore, debridement instruments might be different. The laser may be a valuable tool to detoxify the implant surface [Figure 7], and significant bacterial reduction should lead to a more satisfactory recovery.[7] It is possible to point the diode laser insert toward the wall of the ulcerated pocket epithelium to kill virulent periodontal pathogens. Vaporization of granulomatous tissue seems to result in a more favorable effect compared to that of solo instrumentation.[8]

The diode laser detoxifies root and implant surfaces by inactivating bacterial endotoxins.[7] It is hemostatic and produces no smear layer. The thermal effect weakens calculus chemical adhesion to the root and/or implant, facilitating its removal by curette or ultrasonic devices.[9] The diode laser also stimulates fibroblasts and osteoblasts,[7] which, in turn, cause increased production of RNA messengers, leading to significant collagen production during periodontal tissue healing. The patient experienced no postoperative discomfort and he was able to comply with home care procedures, such as debridement, after the surgery. In contrast, patients often have post-treatment discomfort, and compliance with home care procedures decreases because the recommended home care protocols for plaque control are painful; this results in impaired healing.

Important changes were also detected in the patient: Bleeding, a marker of inflammation with a high prognostic value, was compared at baseline and at 1 year after laser-assisted periodontal therapy, and was reduced significantly to <20%. Absence of bleeding has a negative predictive value.[10]

Besides laser therapy, the following therapeutic interventions are recommended: Chlorhexidine gel placement, and manual and ultrasonic scaling. All of these combined may have contributed to healing, complicating isolation of the most effective modality. However, laser treatment alone has not been demonstrated to be sufficient. The laser has been used as an adjunct to many periodontal treatments, but it is not a replacement for conventional non-surgical treatment or proper home care with adequate patient compliance.

The absence of attached gingiva may be an etiological factor in the development of peri-implantitis; this issue is controversial.[11-14]

CONCLUSION

Traditional protocols of non-surgical periodontal therapy, in conjunction with the use of an 810-nm diode laser, can be an effective alternative treatment modality for peri-implantitis. Other treatment options may successfully enhance resolution of peri-implant soft and hard tissue inflammation, and preserve long-term periodontal health. Regardless of the method used, correctly performed supportive periodontal therapy is a key factor in successful implant therapy.

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