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Non-surgical Treatment of Peri-implant Inflammation with the Adjunctive Use of the Diode Laser (810nm) Case Presentation

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Case Study

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ABSTRACT

Objective: The aim of this study is to discuss the non-surgical periodontal instrumentation, (which is necessary and irreplaceable) with the adjuctive use of diode laser (810nm), in the treatment of peri-implant infalmmation. Data are limited to a case report.
Presentation of Case: After 12 years from implants insertion, which was carried out in 1992, a periodontally susceptible patient, shows signs of peri-implant inflammation (2004). Nowadays, after non-surgical periodontal laser-assisted therapy and 9 years of follow-up, implants shows no more signs of inflammation.
Periodontal Therapy and Supportive Treatment are Made of Two Indispensable Phases: professional oral hygiene and home care instruction. During professional oral hygiene appointment, in addition to mechanical (dedicated ultrasonic inserts) and manual (titanium curette) non-surgical periodontal instrumentation, a diode laser in pulsed wave, at of 1Watt (2Watt the first appointment) for 20sec in duplicate at each site, was used. Professional treatment included also air polishing with glycine powder and application of CHX 0,5%gel. The patient was instructed in proper home care.
Discussion and Conclusion: each treatment stage was carried out as required by the protocol and the patient has faithfully followed the oral hygiene instructions. Peri-implant clinical situation has remained fairly stable, showing normal periodontal parameters, after

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more than 20 years from implants insertion. The present case shows how, traditional protocols of non-surgical periodontal therapy, in conjunction with the diode (810nm) laser, seem to be an effective alternative treatment modality in non-surgical treatment of peri-implantitis, in a periodontal susceptible patient. Obviously, data are limited the present case report and should be validated by further longitudinal clinical studies.

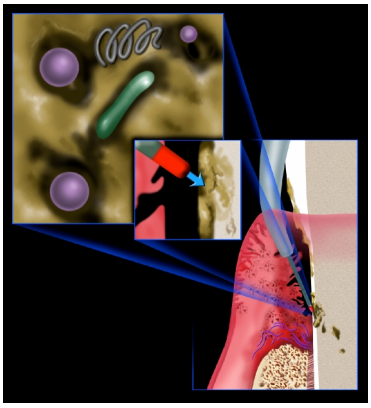
Keywords: Diode laser; peri-implant inflammation; non-surgical periodontal treatment; gauze; chlorexidine; oral hygiene.

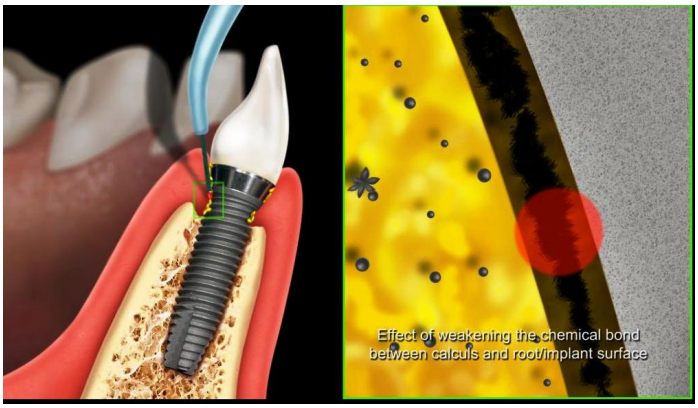
1. INTRODUCTION

Dental implants have emerged as a first line of treatment to replace missing teeth for both the edentulous and partially dentate patients [1]. The anticipated high degree of success is somewhat challenged by the onset of peri-implantitis for some patients and must be diagnosed and terminated as soon as possible. High survival rates for implants and implant-supported single crowns can be expected. However, biological and particularly technical complications are frequent [2,3]. Ninety-four per cent of combined tooth-implant fixed partial dentures survive 5 years [4,5] and 82.1% 10-year survival of combined tooth-implant-supported fixed partial dentures [2].

Depending on the severity of the peri-implantitis lesion, surgical or non-surgical procedures should be implemented. Besides mechanical debridement, which always remains necessary and irreplaceable, combined with antiseptic/antibiotic therapy [6], the adjunctive use of the laser may be used for treating peri-implantitis [7-9].

The high-level laser therapy can help to detoxify thoroughly diseased peri-implant tissues and could promote improved healing and regeneration [10,11] (Fig. 1); laser seems to weaken the calculus chemical bond between roots and implant surfaces [12] (Fig. 2).





Figs. 1-2. Laser fiber, used against subgingival deposits seems to have a bactericidal effect and it is able to weaken the calculus chemical bond between roots and implant surfaces

2. CASE PRESENTATION

In a 63-years old man, periodontally compromised right maxillary premolars (Fig. 3), were replaced by implants in 1992 (Fig. 4). After 12 year follow-up, peri-implant pocket depths is ≥7mm, with BoP+ (bleeding on probing) (Fig. 5), and periapical radiograph shows slight bone loss, (Fig. 6), not reaching implants threads.

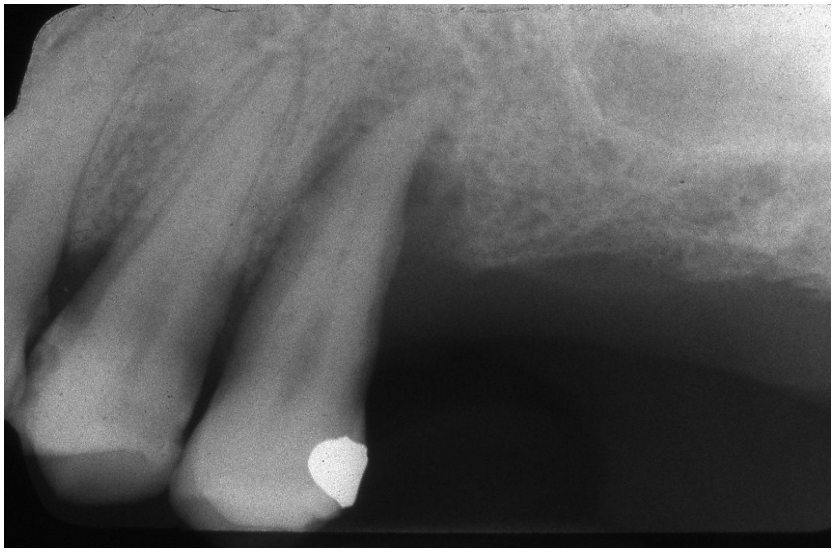


Fig. 3. Periapical radiograph that supports diagnosis of severe periodontal disease involving the second bicuspid (1992)

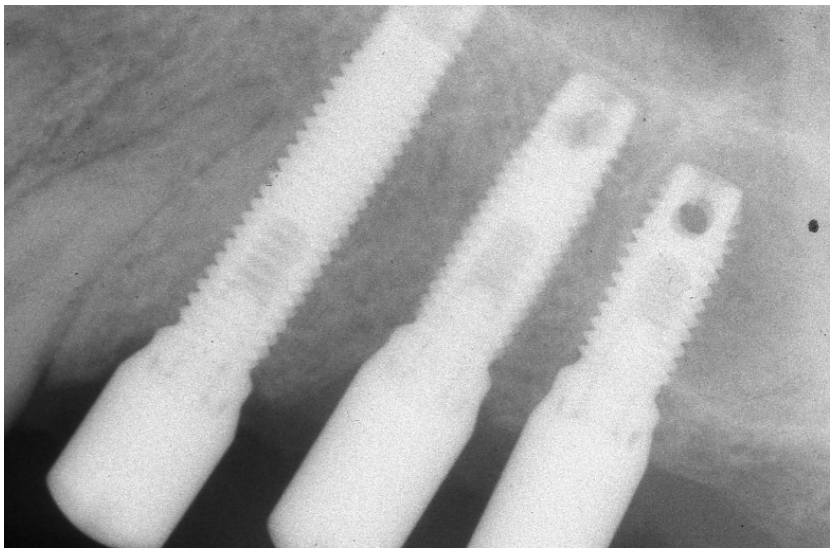


Fig. 4. Periapical radiograph taken at the time of the second stage implant treatment

Fig. 5. Deep pocket depths (≥7mm), bleeding on probing on mesial aspect of an implant replacing the left second bicuspid

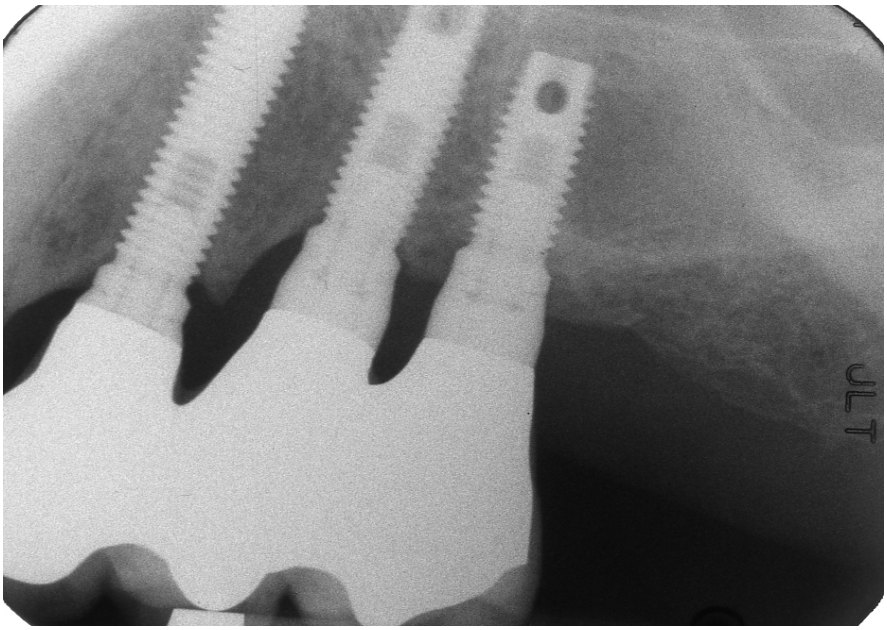


Fig. 6. Follow-up periapical radiograph. Please notice the bone level around the second most distal left implant. The bone loss does not involve implants threads

The diagnosis was: peri-implant mucositis, because of the deep probing depth around the implant, primarily related to long trans-mucosal tract of prosthetic components. A non-surgical treatment protocol, was initially implemented, consisting of:

1. First appointment–day 0:

a. Diode laser scanner treatment (Fig. 7): 2W in pulsating mode (pw), for 20sec. in duplicate on each site, with a fluence of 124J/cm^2. total energy: 20.000mJ, frequency 10Hz. (Diode laser 810nm, "A2g s.r.l."–Rome).
b. Power driven Instrumentation with dedicated inserts: Ultrasonic piezoelectric (Piezomaster 700, EMS, Nyon Switzerland) with PI insert (plastic fused to metal) (Fig. 8), or ultrasonic magnetostrictive (Dentsply Cavitron) insert capped with a plastic disposable tip.
c. Manual instrumentation with titanium Curet (Roncati Implant Care, by Martin, KLS, Tuttlingen, Germany).
d. Subgingival air polishing with glycine or erythritol (EMS, Nyon Switzerland).
e. Tetracycline for 3 minutes+physiologic solution for 30 seconds.
f. Application of chlorhexidine (CHX) gel with a disposable syringe and blunt needle, three folds.
g. Motivation and home oral hygiene instruction: Use of a medicated gauze: soaked in 0.12% Chlorhexidine digluconate (4-5 times daily in between meals) (Digital Brush, Enacare, Micerium,Avegno, Ge, Italy). Rolling stroke brushing technique with ultra soft toothbrush (3 times a day), Interdental brush bathed in CHX gel (3 times a day) (Fig.9).
h. Biostimulation by diode laser (LLLT): Diode laser scanner treatment; the same diode laser is used with a different 6.0mm fiber: and with a different power setting: 0.5W in pulsating mode (pw), for 60sec. in duplicate (twice) on each site, for a total time of 3600 seconds, with a fluence of 1J/cm^2. Total energy: 6.000mJ, frequency 20Hz.
i. Doxycycline 20mg, oral dosing, twice daily, for 3 months.

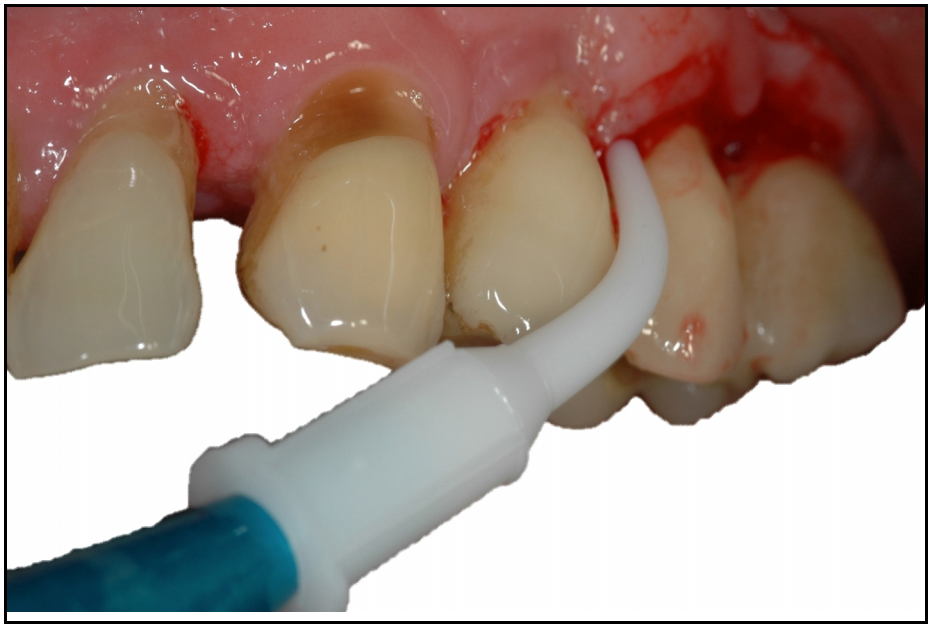


Fig. 7. The area was treated with the adjunctive use of a 810nm diode laser (Diode laser 810nm, "A2g s.r.l."–Rome), in order to disinfect the pocket

Fig. 8. Ultrasonic piezoelectric (Piezomaster 700, EMS, Nyon Switzerland) with PI insert (plastic fused metal) was used to remove plaque and calcified deposits around implants

Fig. 9. The patient was instructed to use an Interdental brush bathed in CHX gel, 3 times a day

2. Second appointment–day 1

a. Diode laser treatment: 1W in pulsating mode (pw), for 20sec. in duplicate on each site, with a fluence of 62J/cm^2. Total energy: 15.000mJ, frequency 10Hz (Diode laser 810nm, "A2g s.r.l."–Rome).
b. Power driven and manual instrumentation, as appropriate, with the same instruments described at day 0.
c. Subgingival air polishing with glycine or erythritol (EMS), application of chlorhexidine (CHX) gel with a disposable syringe and blunt needle, three folds.
d. Motivation and home oral hygiene instruction given on day 0.
e. Biostimulation by diode laser (LLLT): Diode laser treatment as described at day 0.

3. Third appointment–30 days later:

a. Plaque removal as needed.
b. Application of chlorhexidine (CHX) gel with a disposable syringe and blunt needle, three folds.
d. Motivation and home oral hygiene instruction given on day 0.
e. Biostimulation by diode laser (LLLT): Diode laser treatment as described at day 0.

4. Fourth appointment–at 3 months

a. Diode laser treatment: 1W in pulsating mode (pw), for 20sec. in duplicate on each site, with a fluence of 62J/cm^2. Total energy: 15.000mJ, frequency 10Hz (Diode laser 810nm, "A2g s.r.l."–Rome).
b. Power driven Instrumentation and manual instrumentation, as appropriate, with the same instruments described at day 0.
c. Subgingival air polishing with glycine or erythritol (EMS), application of chlorhexidine (CHX) gel with a disposable syringe and blunt needle, three folds.
d. Motivation and home oral hygiene instruction given on day 0.
e. Biostimulation by diode laser (LLLT): Diode laser treatment as described at day 0.

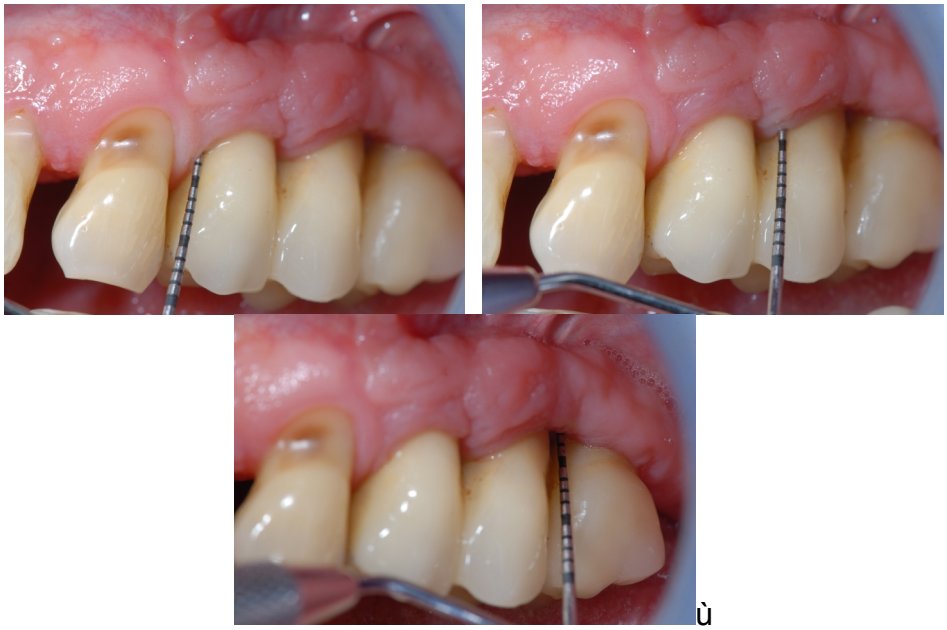
Recall appointment every 3 months. A follow up evaluation should be monitored on a three month periodicity, for an indefinite period of time. Once a year a peri-apical radiograph is needed.

3. RESULTS

At 1 year periodontal re-evaluation shows 3mm probing pocket depth and absence of bleeding on probing, circumferentially around implants (Figs. 10-12).

Clinical conditions seem to maintain clinical stability (Fig. 13), and there is no further bone loss (Fig. 14).

Maintenance protocol consisted of 3 months recall appointments. In addition to the reinforcement of a strict home care and professional mechanical and manual instrumentation, the diode laser, as an adjunctive treatment, was used once a year. Periodontal charting and follow-up peri-apical x-ray were repeated once a year.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Figs. 10-12. Probing pocket depths have been significantly reduced (≤3mm), and there was no bleeding on probing at 1 year revaluation visit

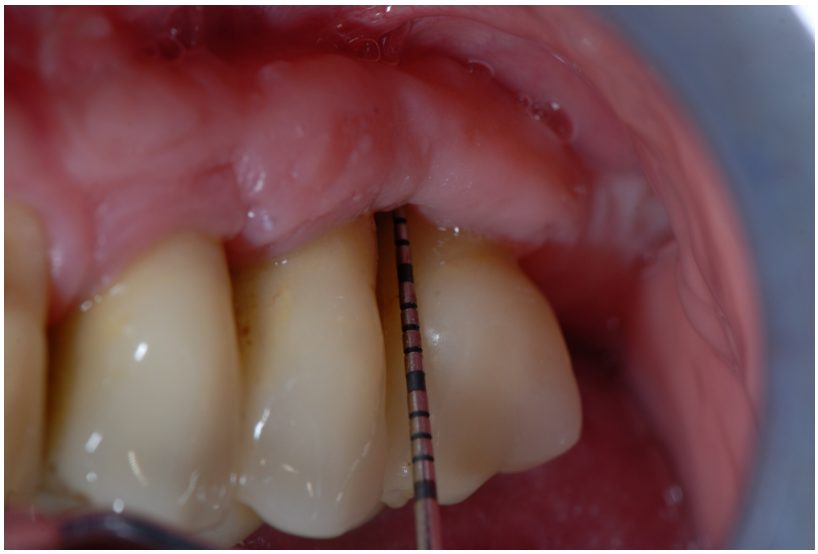

Fig. 13. 9 year follow-up clinical aspect. The probe measures 3 mm pocket depths, BoP Index is negative. The site seems to have recovered clinical stability, 22 years from implants insertion

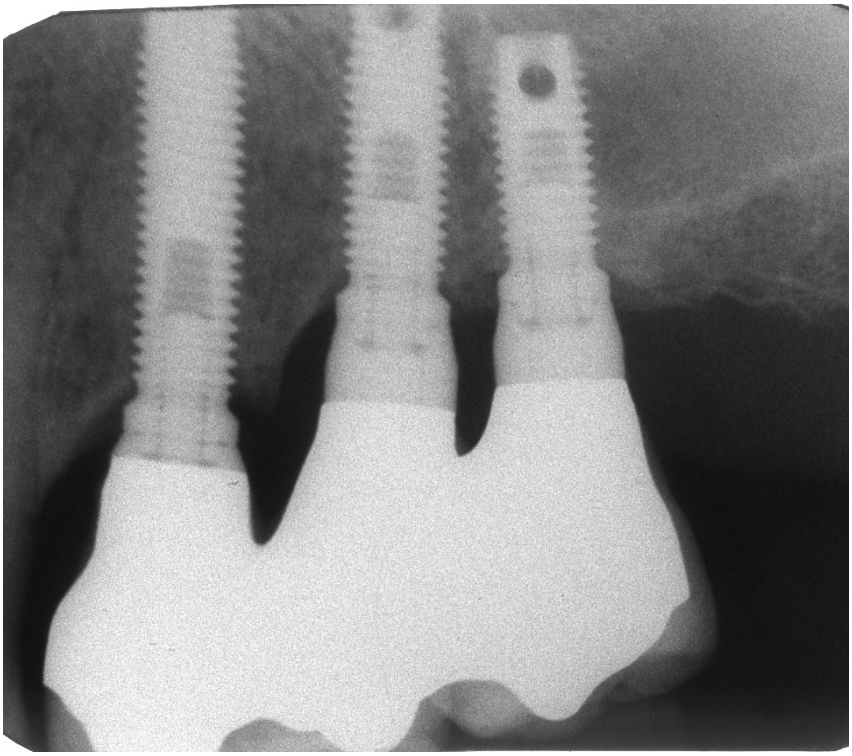

Fig. 14. 9 year follow-up x-ray shows no further bone loss

4. DISCUSSION

The outcome of non-surgical periodontal treatment of peri-implantitis is inconsistent and unpredictable [13]. The incidence of peri-implant infections is increasing dramatically [2-5], especially among patients with a history of periodontitis [14]. A committed teamwork, is initially implement by the periodontist and dental hygienist. The clinical objectives of a non-surgical approach are:

- To reduce the total amount of micro-organisms accumulating on the titanium surface.
- To decrease probing pocket depth (PPD).
- To reduce and possibly eliminate bleeding on probing (BOP).
- To enhance self-performed oral hygiene and peri-implant health.
- To prevent re-infection and
- To improve implant longevity.

Laser treatment may serve as an adjunctive treatment to conventional mechanical therapy in periodontology, including supportive care od peri-implant inflammation [15,16].

Recent studies show promising results in the treatment of peri-implant inflammation [17,18]. However, the laser is not a substitute for mechanical or manual instrumentation of the root-implant surfaces. The diode lasers (800-950nm wavelength) are preferentially absorbed in

pigmented tissues (with high percentage of endogenous chromophores:haemoglobin, melanin), such as peri-implant tissues [17].

The diode and Nd:YAG lasers, when used adjunctively with non-surgical periodontal instrumentation, have been showing to have an addictive effect in reducing subgingival bacterial populations in periodontal pockets of ≥4mm [12,19].

Both lasers seem to weaken the calculus chemical bond to roots and implant surfaces [12].

The success key of a non-surgical periodontal treatment that has a very long follow-up period, is certainly a good self-performed oral hygiene. It 's important to motivate the patient at each recall appointment and instruct him to the best-suited oral hygiene methods. A medicated gauze (soaked in chlorexidine 0.12%, such as Digital Brush (Micerium, Avegno, Ge, Italy), seems to be useful and effective in achieving this goal. This kind of oral hygiene tool, can be used to effectively and simply remove plaque and, in addition to its proper mechanic action, it has even the antiseptic properties of chlorhexidine [20-22].

5. CONCLUSION

This case report presents a protocol for nonsurgical treatment of peri-implant defects using antimicrobials combined with a nonsurgical mechanical treatment and the adjunctive use of the diode laser.

In this case report, peri-implant periodontal parameters (probing pocket depth, BoP indices) were significantly reduced after non-surgical periodontal treatment, at 9 year follow-up re-evaluation, and remained stable overtime, 22 years from implant insertion.

In addition to conventional, manual and power driven, nonsurgical periodontal instrumentation, which remains irreplaceable and necessary, the diode laser seems to be a valuable tool in the treatment of peri-implant infections, for its multiple effects: bactericidal, weakening of the chemical bond between mineralized deposits and implant/root surface, and bio-stimulation [10-12].

For best long term results, supportive therapy is essential. When surgical treatment is contraindicated or not accepted by the patient, for psychological, medical or economic reasons, it is always essential to implement non-surgical therapy.

Randomized longitudinal clinical trials are still needed to confirm the conclusions expressed in this case presentation.

CONSENT

The authors declare that a written informed consent was obtained from the patient for publication of this case report and accompanying images.

ETHICAL APPROVAL

The authors declare that this case study has been carried out in the respect privacy and human rights.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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