



Liran Levin

Water jet with adjunct chlorhexidine gel for nonsurgical treatment of peri-implantitis

Liran Levin, DMD¹/Shai Frankenthal, DMD²/Livia Joseph, DMD²/Doron Rozitsky, DMD, MSc³/Guy Levi, DMD³/Eli E. Machtei, DMD⁴

Background: Peri-implant disease following successful integration of an endosseous implant is the result of an imbalance between bacterial load and host defense, which may affect not only the peri-implant mucosa but also involve the supporting bone. **Objectives:** The aim of this study was to evaluate the adjunctive effect of a dental water jet rinse mixed with chlorhexidine gel to the nonsurgical treatment for peri-implantitis. **Method and Materials:** A prospective randomized interventional cohort study was conducted. Forty consecutive patients presenting with peri-implantitis were recruited and randomly assigned into two treatment groups. Initially all patients received scaling/surface debridement and oral hygiene instruction. Patients in the study group received a water jet device containing chlorhexidine gel (Silodent®) for home use 2x daily while the control group performed the recommended

oral hygiene measures with no water jet usage. Three months following baseline visit, patients were reevaluated clinically and radiographically. **Results:** In total, 39 patients completed the study and were available for final examination. Three months following baseline visit the test group exhibited greater mean probing depth reduction (0.75 mm vs 0.27 mm; $P = .029$) as well as greater reduction in the number of sites presenting with bleeding on probing (2.26 vs 0.45 sites; $P = .011$). No significant change in bone level was observed at 3 months (mean bone gain was 0.18 mm). **Conclusions:** Water jet mixed with chlorhexidine gel might supplement the response to nonsurgical treatment for peri-implantitis lesions. Further, larger-cohort studies are warranted. (*Quintessence Int* 2015;46:133–137; doi: 10.3290/j.qi.a32819)

Key words: bone loss, disinfection, implant threads, peri-implant disease, peri-implant mucositis

Pathologic processes, such as peri-implant mucositis and peri-implantitis, have been diagnosed in the tis-

suues around implants in function.^{1,2} Peri-implant diseases are infectious in nature. Peri-implant mucositis describes an inflammatory lesion that is confined to the surrounding mucosa, while peri-implantitis also affects the supporting bone.¹⁻³ Despite the high success rates of dental implants, it is clear that osseointegrated implants are susceptible to diseases that may eventually lead to dental implant loss.^{4,5}

Epidemiologic studies in implantology are complicated, mainly due to methodologic variability, different implant designs, and different definitions for peri-implant disease. Studies have reported different prevalence rates of mucositis and peri-implantitis. These

¹Head of Research, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel; and Faculty of Medicine, Technion, IIT, Haifa, Israel; and Harvard School of Dental Medicine, Boston, MA, USA.

²Clinical Instructor, Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel.

³Resident, Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel.

⁴Professor and Chair, Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel; and Faculty of Medicine, Technion, IIT, Haifa, Israel; and Harvard School of Dental Medicine, Boston, MA, USA.

Correspondence: Dr Liran Levin, Department of Periodontology, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel. Email: liranl@technion.ac.il



conflicting data hamper the understanding of the global distribution of these conditions.⁶⁻⁸

In light of the available evidence and given the continuously increasing number of implants placed in everyday clinical practice, it is reasonable to anticipate an increasing prevalence of peri-implantitis, which underlines the necessity for a predictable therapy.⁹ Kotsovilis et al,⁹ in their systematic review, concluded that until now, no methodology has been established as a gold-standard approach for the treatment of peri-implantitis. Treatment of peri-implant disease can be nonsurgical, which includes debridement by mechanical means, ultrasonic, or laser devices, either alone or combined with antiseptic and/or antibiotic agents, and surgical, utilizing either resective or regenerative techniques.⁹

Karring et al¹⁰ demonstrated that submucosal debridement alone, accomplished by utilizing either an ultrasonic device or carbon curettes, is not sufficient for the decontamination of the surfaces of implants with peri-implant pockets above 5 mm and exposed implant threads. Renvert et al¹¹ demonstrated that the adjunctive benefits derived from the addition of an antibiotic to mechanical debridement tend to be greater, although to a limited extent, than those achieved by the combined use of an antiseptic (chlorhexidine) and mechanical debridement. The improvements in peri-implant probing depths obtained by the adjunctive local use of minocycline microspheres were shown to be maintained during a short-term period of 12 months.¹¹

The aim of the present study was to evaluate the effect of a dental water jet with adjunct chlorhexidine gel as a nonsurgical treatment for peri-implantitis lesions.

METHOD AND MATERIALS

A prospective randomized interventional cohort study was conducted. The study protocol was initially approved by the institutional review board and all patients signed an informed consent form prior to enrollment into the study. Forty consecutive patients

presenting with peri-implantitis were recruited to this study. Inclusion criteria were an implant presenting with a pocket depth greater than 5 mm with bleeding on probing (BOP) and radiographic evidence of bone loss (≥ 2 mm). Exclusion criteria were treatment for peri-implant disease and/or any local or systemic antibiotic treatment in the past 6 months.

Patients were randomly assigned into two treatment groups. Both groups underwent baseline clinical and radiographic examination followed by full mouth scaling and surface debridement together with oral hygiene instruction. Clinical evaluation included probing depth at six points around the implant, BOP, and mobility. Radiographic evaluation was performed using a parallel periapical radiograph taken with a film-holder to assess the radiographic bone loss around the implant. Implant threads were used as an internal standard for bone loss measurements as previously described.^{12,13}

The study group received a novel water jet device (Fig 1; Silodent®) for home use twice a day; in addition to the water irrigation effect, a 5 ml chlorhexidine gel (chlorhexidine, Lacer) was inserted into a designated slot in the device to carry it into the pocket. The control group performed the recommended oral hygiene measures with no water jet usage. Three months following baseline visit, patients were reevaluated clinically and radiographically using the same measurements as in the baseline examination.

Statistical analyses were performed using StatPlus software (version 5.8.4; AnalystSoft). Data analysis included frequency distributions and cross-tabulations. Associations between variables were studied using Student's *t* test. Chi-square analyses were used to assess relations between categorical data. Significance levels were set at $P < .05$.

RESULTS

Overall, 39 patients completed the study and were evaluated; the mean age was 58.98 ± 9.30 years. There were 20 (51.3%) females and 19 males. Four participants (10.3%) reported current smoking while three



Fig 1 The water jet with adjunct chlorhexidine gel connected to the tap.

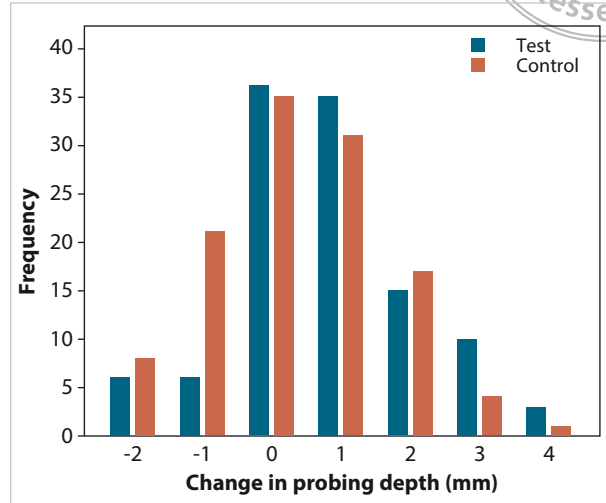


Fig 2 Changes in probing depth during 3 months in the test and the control group.

(7.7%) reported past smoking. The distribution of the implants in the arch is shown in Table 1.

The mean (\pm standard deviation) baseline pocket depth (all sites) in the control group was 5.39 ± 1.09 mm with average radiographic bone loss of 2.60 ± 2.50 mm. The mean baseline pocket depth in the test group was 5.40 ± 1.79 mm with average radiographic bone loss of 2.74 ± 2.10 mm (both groups being similar [$P > .05$]). BOP at baseline was evident in 4.50 ± 1.82 of the measured sites in the control group and in 4.47 ± 1.74 sites in the test group. Mobility was not detected in any of the implants in both groups. There was no statistical difference in all the other parameters (at baseline) between the test and control groups.

Mean pocket depth after 3 months in the control group was 5.12 ± 1.43 mm with average radiographic bone loss of 2.30 ± 2.05 mm. The mean pocket depth after 3 months in the test group was 4.66 ± 1.95 mm with average radiographic bone loss of 2.68 ± 2.31 mm. At 3 months, the number of sites with BOP was 4.05 ± 2.16 in the control group and 2.21 ± 2.15 sites in the test group.

These changes in implant probing depth (IPD) in the test group were better than in the control (Fig 2): Δ IPD of 0.75 mm versus only 0.27 mm respectively

Area	The distribution of the implants according to position in the dental arch	
	Maxilla	Mandible
Anterior	4	4
Premolar	11	2
Molar	11	7

($P = .029$). Likewise, the reduction in sites presenting with BOP was greater in the experimental group (2.26) compared with the control (0.45; $P = .011$). When changes in the deepest initial IPD around each implant were compared, a greater reduction was observed in both groups; however, it did not reach statistical significance ($P = .26$; Fig 3). No significant change in bone level was observed in 3 months (mean bone gain was 0.18 mm).

DISCUSSION

This preliminary study might suggest that the use of the tested water jet device coupled with chlorhexidine gel in the jet stream might serve as a potential adjunctive measure in the nonsurgical treatment of peri-implantitis.

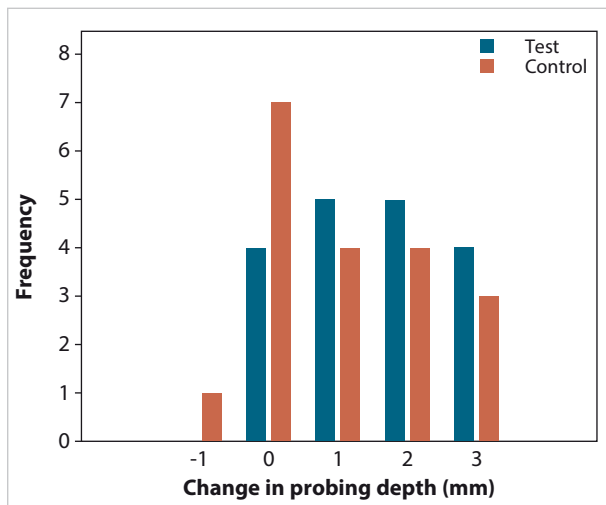


Fig 3 Changes in probing depth in the deepest pocket during 3 months in the test and the control group.

Renvert et al,¹⁴ in their literature review on nonsurgical treatment of peri-implant mucositis and peri-implantitis, concluded that mechanical nonsurgical therapy could be effective in the treatment of peri-implant mucositis lesions. Furthermore, the adjunctive use of antimicrobials has been shown to enhance the outcome of mechanical therapy of such lesions. This could partially explain the benefit from using the water jet with adjunct chlorhexidine gel as seen in the current results. However, when peri-implantitis was explored, nonsurgical therapy was not found to be effective,¹⁴ in contrast with the present results. The discrepancy might be attributed to the unique, thin, jet properties, which might provide better penetration, and to the activity of the chlorhexidine gel deep inside the peri-implant pocket. Moreover, the chlorhexidine gel tends to stick to the tissues and might further add to the overall activity of the device.

Previous studies have discussed some potential risk factors for peri-implantitis; these include past and present periodontal diseases, peri-implant mucositis, smoking, diabetes, poor plaque control, and a lack of preventive maintenance regimen.^{8,15,16} The absence of preventive maintenance in individuals with preexisting peri-implant mucositis was associated with a high incidence of peri-implantitis.⁸ While disease prevention was

beyond the scope of this study, it is still the preferred treatment modality;¹⁷ thus further such preventive studies are warranted to reveal the preventive potential of a Silodent® device. Mucositis represents a host response to the challenge caused by the bacterial biofilm and is an obvious precursor to peri-implantitis.^{1,2} Reducing or eliminating the bacterial biofilm will help in treatment as well as prevention of these conditions around implants. In a recent review by Salvi and Zitzmann,¹⁸ it was concluded that in order to achieve high long-term survival and success rates of dental implants and their restorations, enrollment in a regular maintenance program including anti-infective preventive measures should be implemented. Therapy of peri-implant mucositis should be considered as a preventive measure for the onset of peri-implantitis. The present result might call for implementation of the chlorhexidine gel enhanced water jet in such preventive programs. Further research, however, is needed to provide evidence for the long-term preventive abilities of this device.

Persson et al,¹⁹ in clinical and microbiologic results of nonsurgical treatment of peri-implantitis using air abrasion or laser, reported probing depth reductions in both groups of 0.8 mm to 0.9 mm. Sahm et al,²⁰ using manual debridement or an air abrasive device, reported approximately 0.5 mm pocket reduction in both groups. In a network meta-analysis comparing different treatment modalities for peri-implantitis, the overall calculated weighted mean probing depth reduction was 0.77 mm 4 months after nonsurgical treatment.²¹ The present results are in accordance with those findings. Machtei et al²² examined a protocol of intensive application of chlorhexidine containing chips in sites with peri-implantitis and reported better results with the test group.

BOP was significantly improved in the test group of the present study, even when compared to previous reports in the literature.²²⁻²⁴ The relatively considerable proportions of sites with persistent BOP, even postoperatively, further emphasize the aggressive nature of the inflammatory process in peri-implantitis. Thus, sites with residual BOP would require constant monitoring, and further therapy in the unlikely event of further deterioration.

CONCLUSION

Water jet with adjunct chlorhexidine gel might serve as a nonsurgical treatment option for peri-implantitis lesions. Further, larger-cohort studies are warranted.

REFERENCES

1. American Academy of Periodontology. Peri-implant mucositis and peri-implantitis: a current understanding of their diagnoses and clinical implications. *J Periodontol* 2013;84:436–443.
2. Lang NP, Berglundh T. Peri-implant diseases: where are we now? Consensus of the Seventh European Workshop on Periodontology. *J Clin Periodontol* 2011;38(Suppl 11):178–181.
3. Lindhe J, Meyle J. Peri-implant diseases: Consensus Report of the Sixth European Workshop on Periodontology. *J Clin Periodontol* 2008;35(Suppl 8): 282–285.
4. De Boever AL, Quirynen M, Coucke W, Theuniers G, De Boever JA. Clinical and radiographic study of implant treatment outcome in periodontally susceptible and non-susceptible patients: a prospective long-term study. *Clin Oral Implants Res* 2009;20:1341–1350.
5. Levin L. Peri-implantitis: the disease of the future. *Quintessence Int* 2013;44:643.
6. Berglundh T, Persson L, Klinge B. A systematic review of the incidence of biological and technical complications in implant dentistry reported in prospective longitudinal studies of at least 5 years. *J Clin Periodontol* 2002;29(Suppl 3):197–212.
7. Koldsland OC, Scheie AA, Aass AM. Prevalence of peri-implantitis related to severity of the disease with different degrees of bone loss. *J Periodontol* 2010;81:231–238.
8. Costa FO, Takenaka-Martinez S, Cota LOM, Ferreira SD, Silva GLM, Costa JE. Peri-implant disease in subjects with and without preventive maintenance: a 5-year follow-up. *J Clin Periodontol* 2012;39:173–181.
9. Kotsovilis S, Karoussis IK, Trianti M, Fourmousis I. Therapy of peri-implantitis: a systematic review. *J Clin Periodontol* 2008;35:621–629.
10. Karring ES, Stavropoulos A, Ellegaard B, Karring T. Treatment of peri-implantitis by the Vector system. *Clin Oral Implants Res* 2005;16:288–293.
11. Renvert S, Lessem J, Dahlén G, Lindahl C, Svensson M. Topical minocycline microspheres versus topical chlorhexidine gel as an adjunct to mechanical debridement of incipient peri-implant infections: a randomized clinical trial. *J Clin Periodontol* 2006;33:362–369.
12. Levin L, Hertzberg R, Har-Nes S, Schwartz-Arad D. Long-term marginal bone loss around single dental implants affected by current and past smoking habits. *Implant Dent* 2008;17:422–429.
13. Levin L, Nitzan D, Schwartz-Arad D. Success of dental implants placed in intraoral block bone grafts. *J Periodontol* 2007;78:18–21.
14. Renvert S, Roos-Jansåker A-M, Claffey N. Non-surgical treatment of peri-implant mucositis and peri-implantitis: a literature review. *J Clin Periodontol* 2008;35(Suppl 8):305–315.
15. Levin L, Ofec R, Grossmann Y, Anner R. Periodontal disease as a risk for dental implant failure over time: a long-term historical cohort study. *J Clin Periodontol* 2011;38:732–737.
16. Anner R, Grossmann Y, Anner Y, Levin L. Smoking, diabetes mellitus, periodontitis, and supportive periodontal treatment as factors associated with dental implant survival: a long-term retrospective evaluation of patients followed for up to 10 years. *Implant Dent* 2010;19:57–64.
17. Levin L. Prevention: the (sometimes-forgotten) key to success. *Quintessence Int* 2012;43:789.
18. Salvi GE, Zitzmann NU. The effects of anti-infective preventive measures on the occurrence of biologic implant complications and implant loss: a systematic review. *Int J Oral Maxillofac Implants* 2014;29(Suppl):292–307.
19. Persson GR, Roos-Jansåker AM, Lindahl C, Renvert S. Microbiologic results after non-surgical erbium-doped:yttrium, aluminum, and garnet laser or air-abrasive treatment of peri-implantitis: a randomized clinical trial. *J Periodontol* 2011;82:1267–1278.
20. Sahn N, Becker J, Santel T, Schwarz F. Non-surgical treatment of peri-implantitis using an air-abrasive device or mechanical debridement and local application of chlorhexidine: a prospective, randomized, controlled clinical study. *J Clin Periodontol* 2011;38:872–878.
21. Faggion CM Jr, Chambrone L, Listl S, Tu YK. Network meta-analysis for evaluating interventions in implant dentistry: the case of peri-implantitis treatment. *Clin Implant Dent Relat Res* 2013;15:576–588.
22. Machtei EE, Frankenthal S, Levi G, et al. Treatment of peri-implantitis using multiple applications of chlorhexidine chips: a double-blind, randomized multi-centre clinical trial. *J Clin Periodontol* 2012;39:1198–1205.
23. Heitz-Mayfield LJ, Salvi GE, Botticelli D, Mombelli A, Faddy M, Lang NP. Anti-infective treatment of peri-implant mucositis: a randomised controlled clinical trial. *Clin Oral Implants Res* 2011;22:237–241.
24. Renvert S, Samuelsson E, Lindahl C, Persson GR. Mechanical non-surgical treatment of peri-implantitis: a double-blind randomized longitudinal clinical study. I: clinical results. *J Clin Periodontol* 2009;36:604–609.