

The Effectiveness of Orally Administered Probiotic on Peri-Implant Tissue Condition: A Prospective Study

Vladimir Kokovic¹, Vladimir S. Todorovic², Aleksandar Kokovic³, Rajiv Saini^{4*}

ABSTRACT

Purpose: This study investigated the effects of a probiotic lozenges in peri-implantitis patients. **Method:** 40 patients with mild to moderate peri-implantitis were involved in this study. Following a baseline clinical examination, a probiotic supplementation along with routine oral hygiene was recommended. The clinical examination was repeated at 30 and 90 days after beginning of probiotics supplementation. The clinical examination included probing pocket depth (PPD), bleeding on probing (BOP), the implant plaque index (IPI), implant stability (IS) and radiographic assessment. **Results:** Significant difference was observed in bleeding on probing (BOP), the implant plaque index (IPI) while probing pocket depth (PPD), implant stability (IS) and radiographic assessment didn't show any statistical difference from baseline. **Conclusion:** This study suggests that probiotic supplementation prevents inflammation (bleeding on probing) by potentially interfering with microbial biofilm formation and affecting host responses in peri-implantitis patients.

Key words: Hyperbiotics, Peri-Implantitis, Biofilm, Implants.

INTRODUCTION

Inflammation surrounding an implant may gradually contribute to implant failure. Though peri-implant mucositis and peri-implantitis differ in site and clinical severity, both pathologies, from a diagnostic and pathogenesis standpoint, are fundamentally the same.¹ Uncorrected peri-implant mucositis is previously reported to be associated with a high incidence of peri-implantitis.² This highlights the importance of eliminating peri-implant mucositis as a preventive approach to peri-implantitis.

Basic peri-implant maintenance therapy (PIMT) is a crucial component of successful implant treatment, where the suggested reasonable interval is 5 or 6 months.³ However, this does vary and is hence customized to fit each patient, depending on important clinical factors such as history of periodontal disease.⁴ Many therapeutic and adjunctive procedures for implant maintenance, such as mechanical debridement,⁵ photodynamic therapy,⁵ Er:YAG laser,⁶ and sub gingival glycine air polishing⁵ have been previously investigated. Amongst the recent adjunctive therapeutic approaches to PIMT, orally-administered probiotics, has gained clinical spotlight. Probiotics represent a new area of research in oral medicine, with potential role in protecting oral tissue from cariogenic bacteria and periodontal pathogenesis.⁷⁻⁸ Oral probiotics create biofilm on implant surface what is important etiological factor for protection of the peri-implant tissue agent's action of periodontal pathogenic bacteria.⁹ In this uncontrolled clinical

study we evaluated the effects of orally-administered probiotics on the peri-implant health of patients with dental implants.

MATERIALS AND METHODS

Patient Selection: A total of 40 patients with implant-supported fixed prosthetic restoration (crowns and bridges) in the upper and lower jaw were consecutively recruited following informed consent. The study was reviewed and approved by the institutes' ethics committee. Each of the 40 selected patients were considered as a statistical unit. Candidates were admitted into the study after they fulfil the inclusion and exclusion criteria as mentioned in Table 1.

Clinical Assessment: Following the collection of informed consent, baseline measurements related to the implants were recorded. These measurements included:

- 1. Probing Pocket Depth (PD):** It was recorded in millimetres (mm) as the distance between the gingival margins to the base of the peri-implant sulcus using a Williams periodontal probe with 1-2-3-4-5-7-9-10 mm markings (Hu-Friedy, Chicago, IL, USA). Measurements were collected from six sites around the implant (i.e., mesiolingual, midlingual, distolingual, mesiobuccal, midbuccal and distobuccal).
- 2. Implant Plaque Index (IPI):** Biofilm formation in the marginal area of dental implants was recorded according to a 3-point scale¹⁰ (0- No visible

Vladimir Kokovic¹, Vladimir S. Todorovic², Aleksandar Kokovic³, Rajiv Saini^{4*}

¹Professor and Head, Advance Europe Medical Centre, Sharjah, UAE.

²Research Associate, School of Dental Medicine, University of Belgrade, SERBIA.

³DMD Student, Danube Private University, Krems, AUSTRIA

⁴Visiting professor, Department of Interdisciplinary Medicine, School of Medicine, University of Bari ALDO MORO, Bari, ITALY.

Correspondence

Dr. Rajiv Saini

Visiting professor, Department of Interdisciplinary Medicine, School of Medicine, University of Bari ALDO MORO, Bari, ITALY.

Email: drrajivsaini@gmail.com

Ph.no: +91-9923206789

History

- Submission Date: 06-03-2018;
- Review completed: 21-03-2018;
- Accepted Date: 23-03-2018.

DOI : 10.5530/bems.4.1.5

Article Available online

<http://www.bemsreports.org>

Copyright

© 2018 Phcog.Net. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International license.

Cite this article : Kokovic V, Todorovic VS, Kokovic A, Saini R. The Effectiveness of Orally Administered Probiotic on Peri-Implant Tissue Condition: A Prospective Study. BEMS Reports, 2018;4(1):17-9.

plaque; 1- Local plaque accumulation, 2- General plaque accumulation greater than 25%).

3. Implant Bleeding on Probing (BoP): It was recorded using dichotomous value depending on whether the site presented bleeding or not (1 - Bleeding and 0 - No bleeding). Gentle probing (<0.25N) [11] was performed using Williams periodontal probe and the observation was recorded 30s after probing.

4. Implant Stability (IS): Implant stability was measured using resonance frequency analysis, Osstell IDx (Osstell, Sweden). The fixed restorations were unscrewed from the implants and the Smart Peg (Type 54) has been fixed via a torque of 10Ncm with Smart Peg Mount. The Osstell IDx probe was placed perpendicular to the Smart Peg at a maximum distance of 2mm. After recording the measurement value, the fixed restorations were fixed back onto the implant with a torque of 15Ncm. All data were recorded on the Osstell IDx database.

Radio graphical Assessment: The peri-implant marginal bone level (MBL) were recorded using a periapical X-ray obtained using RXCC intraoral X-ray unite (MyRay, Imola, Bologna, Italy) standardized using a sensor holder with the individually customized occlusal impression of each patient. Exposure time of 0.8s was performed. The distance between the abutment shoulder and alveolar crest was measured mesially and distally in millimetres (mm).

Schedule of Events: All measurements were performed in Dental Department of Advance Europe Medical Centre (Sharjah, UAE). After the base line clinical and radiological examination, oral probiotic lozenges (Hyperbiotics Pro-Dental, USA) were administered (one tablet every 24 hr) for 90 days. All the subjects were asked to participate clinical evaluation on baseline, 30 and 90 days following probiotic administration.

Statistical Analysis: All data were first analysed by descriptive methods (QQ plots, box plots) (SPSS 18.0; SPSS, Austin, TX, USA). The patients were chosen as the unit for statistical analysis. The Wilcoxon signed rank test was used as well as Pearson's coefficient of correlation. The level of significance chosen in all statistical test was at $P < 0.05$.

RESULTS

Totally 40 patients (12 women and 28 men) with mean age of 43.81 ± 1.73 (Age ranges from 23-65 years) completed the study. 52 bone level tapered implants (Straumann AG, Basel, Switzerland) to support screw retained full ceramic restorations (34 patients with solo crowns and 6 patients with three-unites bridges) were analysed in this study (Figure 1 and 2).

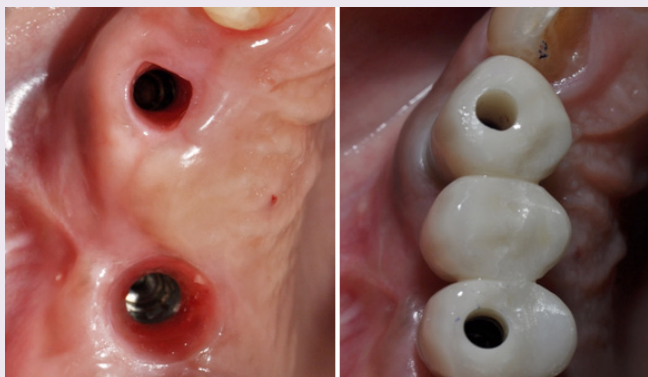


Figure 1: Bone Level Tapered implants used for supporting three-unites full-ceramic bridge.

Statistically significant differences were presented for parameters Implant plaque index (IPI) and bleeding on probing (BoP) between base line and time-point 90 days (Table 2). General plaque accumulation greater than 25% was observed in one patient (2.5%) at baseline. While local plaque accumulation (IPI point 1) was observed in 29 patients (72.5%). Absence of plaque accumulation was observed in 25 patients (62.5%), ninety days after using oral probiotics. BoP at baseline was observed during probing in 29 of 40 patients (72.5%). This number was significantly reduced to 22.5% after 90 days of using oral probiotic lozenges.

We didn't observe any statistical differences ($p > 0.05$) between mean values of clinical parameters (PD, IS) and marginal bone level MBL when compared together at baseline, 30 and 90 days (Table 3). The mean probing depth (PD) calculated from probing depths at six sites per implant was 2.3mm (varying from 1 to 4 mm), 2.1mm and 2.0mm at baseline 30 days and 90 days respectively post probiotic administration. On baseline measured implant stability (IS) mean value of all fifty-two implants was 72.53 ISQ (ranging from 65 to 78 ISQ). We didn't observe decreasing of implant stability during the study. Marginal bone level (MBL) calculated using the average distance between implant shoulder and alveolar crest mesially and distally of each implant was 2.73 mm (ranging from 1 to 4 mm) and remained similar at 30th day (2.68 mm) and 90th day (2.62 mm).

DISCUSSION

Peri-implantitis is an irreversible inflammatory disease that affects both the soft and hard tissues of a dental implant. If left untreated, it will result in implant failure in most instances. The most common cause of peri-implantitis is the accumulation of dental plaque and formation of a bacterial biofilm on the implant surface.¹¹⁻¹⁵ Treatment of peri-implantitis will differ depending upon whether it is a case of peri-implant mucositis or peri-implantitis. The management of implant infection should be focused on the control of infection, the detoxification of the implant surface, and regeneration of the alveolar bone. Therefore, adjunctive peri-implant therapies, such as antibiotics, antiseptics, and ultrasonic and laser treatments, have been proposed to improve the non-surgical treatment options of peri-implant mucositis and peri-implantitis. Regenerative procedures using a bone graft substitute in combination with a membrane have been proposed to treat bone defects in advanced cases of peri-implantitis. Sustaining healthy oral micro biome is the fundamental to preventing plaque accumulation that further modulate host immune inflammatory events around the dental implant. Plethora of clinical studies has established that Probiotics can influence oral health through interaction with oral micro biome.



Figure 1: Bone Level Tapered implants used for supporting three-unites full-ceramic bridge.

Table 1: Study Selection Criteria.**Inclusion Criteria**

- Age > 18
- ASA Class I or II (American Society of Anaesthesiologists, 1963)
- Non-smoking
- Patients with titanium dental implants and a screw retained fixed prosthetic restoration in function for at least 1 month

Exclusion Criteria

- Pregnant or lactating women
- Previous or current history of alcoholism or smoking;
- Previously required prophylaxis for bacterial endocarditis
- Current or recent use of local or systemic antibiotic, anti-inflammatory, antiseptic, and/or probiotic therapy within the last 3 months
- Current or previous use of bisphosphonates, radiotherapy, chemotherapy or any medication that affects periodontal health
- Systemic conditions such as neurologic deficiencies, immunodeficiencies, uncontrolled diabetes; rheumatoid, hepatic, renal, cardiovascular or infectious pathologies
- Implants with mobility and/or radiographic bone loss \geq 50% of implant length

The present study was hence designed to evaluate the efficacy of oral probiotics (Hyperbiotics Pro-Dental, USA) on dental implants along with routine standard plaque control measure in active peri-implantitis patients in 3-month clinical follow up. The significant reduction in Implant plaque index (IPI) and bleeding on probing (BoP) was observed as the clinical outcome of probiotic application in this study. Significant reduction in plaque index and absence of bleeding on probing are the key components to establish the health and longevity of dental implants. The results of this study are consistent with previous studies evaluating the orally administered probiotics for preventing inflammation by affecting host responses in peri-implantitis patients.^{8,16-17} In this study the orally administered probiotic (Hyperbiotics Pro-Dental, USA) was safely accepted by all the subjects and we didn't observe any adverse effects in any of the subjects in this study.

CONCLUSION

This study shows the clinical significance of orally-administered probiotics (Hyperbiotics Pro-Dental, USA) on the implant plaque accumulation and bleeding on probing in patients with dental implants. The long-term effects of oral-administrated probiotics can significantly increase the chances of implant success especially among patients who develop peri-implantitis.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Lang NP, Berglund T. Behalf of Working Group 4 of the Seventh European Workshop on Periodontology, Periimplant diseases: Where are we now? - Consensus of the Seventh European Workshop on Periodontology. *J Clin Periodontol.* 2011;38:178-81. doi:10.1111/j.1600-051X.2010.01674.x.
2. Costa FO, Takenaka-Martinez S, Cota LO, Ferreira SD, Silva GL, Costa JE. Peri-implant disease in subjects with and without preventive maintenance: A 5-year follow-up. *J Clin Periodontol.* 2012;39(2):173-81. doi: 10.1111/j.1600-051X.2011.01819.x.
3. Monje A, Aranda L, Diaz KT, Alarcón MA, Bagramian RA, Wang HL, et al. Impact of Maintenance Therapy for the Prevention of Peri-implant Diseases: A

Table 2: Comparison of mean values of IPI and BoP.

Parameter	Base line	30 days	90 days
IPI	0.77± 0.21	0.62 ± 0.15	0.37±0.18
BoP	0.85 ± 0.23	0.72 ± 0.21	0.22±0.19

IPI: Implant Plaque Index, BoP: Bleeding on Probing.

Table 3: Comparison of mean values of PD, IS and MBL.

Parameter	Base line	30 days	90 days
PD	2.3 ± 0.15	2.1 ± 0.21	2.0 ± 0.19
IS	72.53± 1.12	72.64±1.08	73.67±1.67
MBL	2.73±0.25	2.68±0.27	2.62±0.18

PD: Probing Depth, IS: Implant Stability, MBL: Marginal Bone Level.

Systematic Review and Meta-analysis. *J Dent Res.* 2016;95(4):372-9. doi: 10.1177/0022034515622432.

4. John G, Becker J, Schmucker A, Schwarz F. Non-surgical treatment of peri-implant mucositis and peri-implantitis at two-piece zirconium implants: A clinical follow-up observation after up to 3 years *J Clin Periodontol.* 2017;44:756-61. doi: 10.1111/jcpe.12738.
5. Mongardini C, Pilloni A, Farina R, Di Tanna G, Zeza B. Adjunctive efficacy of probiotics in the treatment of experimental peri-implant mucositis with mechanical and photodynamic therapy: A randomized, cross-over clinical trial. *J Clin Periodontol.* 2017;44(4):410-7. doi: 10.1111/jcpe.12689.
6. Jing WD, Wang XE, Xie YS, Han J, Xu L. [Efficacy of subgingival glycine air polishing on patients with early peri-implant diseases]. *Zhonghua Kou Qiang Yi Xue Za Zhi.* 2017;52(8):480-5. doi: 10.3760/cma.j.issn.1002-0098.2017.08.007.
7. Corenelli EM, Guggenheim B, Stingel F, Neeser JR. Selection of dairy bacterial strains as probiotics for oral health. *Euro J Oral Sci.* 2002;110(3):218-24.
8. Mani A, Sani R, Sani SR. Efficacy of oral probiotics as an adjunct to scaling and root planning in nonsurgical treatment outcome of generalized chronic periodontitis patients: A clinic-microbiological study. *Int J Experimental Dent Sci.* 2017;6(1):6-13.
9. Flichy-Fernandez AJ, Ata-Ali J, Alegre-Domingo T, Candel-Marti E, Ata-Ali F, Palacio JR, et al. The effect of oral administered probiotic *Lactobacillus reuteri*-containing tablets in peri-implant mucositis: A double-blind randomized controlled trial. *J Periodontol Res.* 2015; 50(6):775-85.
10. Lindquist LV, Røcker B, Carlson GE. Bone resorption around fixtures in edentulous patients treated with mandibular fixed tissue-integrated prostheses. *J Prosthet Dent.* 1988;59(1):59-63.
11. Lang NP, Berglund T. Processing of seventh European workshop on periodontology. *J of Clin Periodontol.* 2011;38:178-81.
12. Forum SJ, Rosen PS. A proposed classification for peri-implantitis. *Int J Periodontics Restorative Dent.* 2012;32(5):533-40.
13. Alcoforado GA, Rams TE, Feik D, Slots J. Microbial aspects of failing Osseo integrated dental implants in humans. *J Parodontol.* 1991;10(1):11-18.
14. Pontoriero R, Tonelli MP, Carnevale G, Mombelli A, Nyman SR, Lang NP. Experimentally induced peri-implant mucositis. A clinical study in humans. *Clin Oral Implants Res.* 1994;5(4):254-9.
15. Singh P. Understanding peri-implantitis: A strategic review. *J Oral Implantol.* 2011;37(5):622-6.
16. Tada H, Masaki C, Tsuka S, Mukaibo T, Kondo Y, Hosokawa R. The effects of *Lactobacillus reuteri* probiotics combined with azithromycin on peri-implantitis: A randomized placebo-controlled study. *J Prosthodontic Res.* 2018;62(1):89-96.
17. Flichy-Fernández AJ, Ata-Ali J, Alegre-Domingo T, Candel-Marti E, Ata-Ali F, Palacio JR, et al. The effect of orally administered probiotic *Lactobacillus reuteri*-containing tablets in peri-implant mucositis: A double-blind randomized controlled trial. *J Periodont Res.* 2015;50(6):775-85.

Cite this article : Kokovic V, Todorovic VS, Kokovic A, Saini R. The Effectiveness of Orally Administered Probiotic on Peri-Implant Tissue Condition: A Prospective Study. *BEMS Reports*, 2018;4(1):17-9.