EFFICACY OF PROBIOTICS AS AN ADJUNCT TO MECHANICAL THERAPY IN CHRONIC PERIODONTITIS PATIENTS: A PILOT STUDY

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Probiotics are defined as bacteria with physiologic benefits for humans. Through direct or indirect mechanisms, they favourably influence the development and stability of microbiota and stimulate the innate and adaptive immune systems of the host. They have been successfully employed in a variety of systemic disorders. Limited data is available on the efficacy of probiotics in oral environment. This pilot study aims to evaluate the effect of probiotics (ProwelTM containing 2.5 billion active Lactobacillus acidophilus, B. longum, B. bifidum and B. infantis) in chronic periodontitis patients.

Key words: Probiotics, Periodontitis, Bifidobacterium, Lactobacillus

The term 'probiotic' was introduced in 1965 by Lilly and Stillwell[1]. These are live microorganisms which when administered in adequate quantities confer a health benefit on the host[2]. Probiotics favourably influence both the development and stability of microbes, thereby, inhibiting the colonization of pathogens. These also enhance mucosal barrier via tropic effects on epithelium and stimulate both the innate and adaptive immune systems[3]. Probiotic species mostly belong to genera Lactobacillus and Bifidobacterium[4]. These have been used successfully in a variety of systemic disorders like gastrointestinal, urogenital disorders, atopic disease, otitis media etc[1]. Recently studies are being performed to evaluate the effects of probiotics in oral cavity. Consumption of probiotics was found to be effective in reducing the number of Streptococcus mutans in oral cavity leading to reduction of caries risk[5]. Grudianov et al reported that probiotic tablets normalized microbiota in patients with gingivitis and periodontitis[6]. Ishikawa et al also reported a reduction in oral anaerobic flora[7]. However, little is known about the effects of probiotics on periodontal health. The aim of this study was to evaluate the effect of oral administration of Lactobacillus acidophilus, B. longum, B. bifidum and B. infantis on periodontal health in chronic periodontitis patients.

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Materials and method

A randomized controlled pilot trial was performed on 10 (7 females and 3 males) systemically healthy moderate chronic periodontitis patients of age range 30-55 years. A written informed consent was obtained from each patient.

Inclusion and exclusion criteria

Patients who had not been treated for periodontal disease, who had not used antibiotics and probiotics for last 3 months and who did not report allergic reactions to lactose and fermented milk products were included in this study. Pregnant and lactating women, current and former smokers and patients with severely mobile teeth and abscesses were excluded from the study.

All the patients were randomly assigned as test and control group (n=5 in each group). Test group received thorough scaling and root planing (SRP) completed within 24 hours along with probiotic rinse. Each probiotic sachet contained 2.5 billion active Lactobacillus acidophilus, B. longum, B. bifidum and B. infantis. Patients were instructed to mix the contents of the sachet in 10 ml of water, rinse with it for 1 minute and then ingest it. This regimen was followed twice daily. Control group received mechanical therapy only. Clinical parameters namely PPD

(probing pocket depth), CAL (clinical attachment loss) and BOP (bleeding on probing) were recorded from Ramfjord's six teeth (Ramfjord 1959) at baseline (0 day) and then again at 21 days postoperatively with William's periodontal probe. PPD and CAL were measured at 4 sites per tooth. Participants were instructed against changing their oral hygiene habits or taking any other probiotic product throughout the study period.

Data thus collected was subjected to unpaired and paired t-tests. Null's hypothesis was that, adjunctive use of probiotic rinse along with mechanical therapy does not result in better clinical outcome than SRP alone.

Results: These have been depicted in tables 1 and 2 and graphs 1, 2, 3 and 4.

Pre-operative PPD of test and control groups were 5.73±1.70 mm (mean± standard deviation) and 5.03±1.56 mm respectively. Difference between test and control group was found to be statistically non-significant at 0.102 probability (unpaired t-test score was 1.65). 21 days post operative PPD of test and control groups were 3.87±1.41 mm (mean± standard deviation) and 4.10±1.65 mm respectively. Difference between test and control group was found to be statistically non-significant at 0.919 probability (unpaired t-test score was 0.10). The difference between preoperative and postoperative PPD was found to be statistically highly significant in test group (paired t-test value is 7.39 at 0.00 probability). The difference between preoperative and postoperative PPD was found to be statistically highly significant in control group (paired t-test value is 4.06 at 0.00 probability).

Pre-operative CAL of test and control groups were 1.73±1.34 mm and 1.70±1.42 mm respectively. Difference between test and control group was found to be statistically non-significant at 0.557 probability (unpaired t-test score was 0.58). Post-operative CAL of test and control groups were 1.40±1.22 mm and 1.43±1.33mm respectively. Difference between test and control group was found to be statistically non-significant at 0.127 probability (unpaired t-test score was 1.54). The difference between preoperative and postoperative CAL was found to be statistically

Table 1 : Mean, standard deviations of the different parameters and unpaired 't' values for different parameters of control and test group.

Character	Control group Mean±SD	Test Group Mean±SD	't' value	Probability	Significance
	Before the experiment				
Probing depth (mm)	5.03±1.56	5.73±1.70	1.65	0.102	NS
Clinical attachment loss (mm)	1.70±1.42	1.73±1.34	0.58	0.557	NS
Bleeding on probing	1.60±0.72	1.33±0.61	0.93	0.925	NS
	21 days after treatment				
Probing depth (mm)	4.10±1.65	3.87±1.41	0.10	0.919	NS
Clinical attachment loss (mm)	1.43±1.33	1.40±1.22	1.54	0.127	NS
Bleeding on probing	0.63±0.67	0.63±0.61	0.00	1.000	NS

NS = Non-significant Sig = Significant HS = Highly significant

significant in test group (paired t-test value is 2.40 at 0.022 probability). The difference between preoperative and postoperative CAL was found to be statistically significant in control group (paired t-test value is 2.11 at 0.043 probability).

Pre-operative BOP scores of test and control groups were 1.33±0.61mm and 1.60±0.72 mm respectively. Difference between test and control group was found to be statistically non-significant at 0.925 probability (unpaired t-test score was 0.93). Post-operative BOP scores of test and control groups were 0.63±0.61mm and 0.63±0.67mm respectively. Difference between test and control group was found to be statistically non-significant at 1.000 probability (unpaired t-test score was 0.00). The difference between preoperative and postoperative BOP was found to be statistically highly significant in test group (paired t-test value is 6.43 at 0.000 probability). The difference between preoperative and postoperative BOP was found to be statistically highly significant in control group (paired t test value is 6.92 at 0.000 probability).

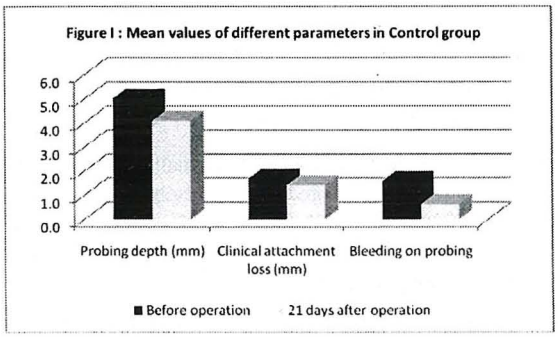
Discussion

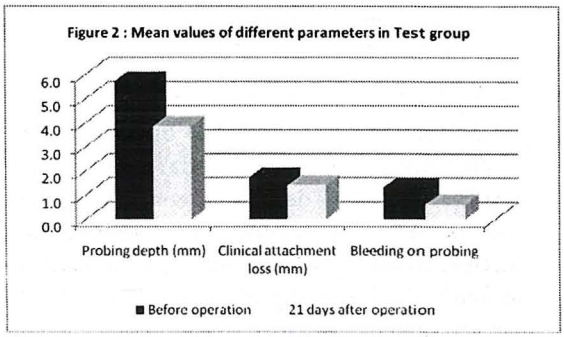
This trial compared the effectiveness of probiotic rinse (ProwelTM containing 2.5 billion active Lactobacillus acidophilus, B. longum, B. bifidum and B. infantis) as an adjunct to mechanical therapy with that of mechanical therapy alone. Antagonistic activity of the probiotics used in our study against common microbial pathogens in GIT or urovaginal environment is well established[8]. Lactobacilli may exert antimicrobial activity by direct and indirect mechanisms. They can directly interact with microbes in dental plaque and oral environment or can indirectly modulate innate / acquired immune systems. These mechanisms may be similar in oral cavity and other parts of the body. However, due to a lack of sufficient scientific research on probiotics in odontology, these effects remain still unclear. The lactobacilli also produce hydrogen peroxide, metabolites such as lactic acid, biosurfactants and small antimicrobial peptides like bacteriocins. These have been shown to activate immunocompetent cells to secrete both inflammatory and anti-inflammatory cytokines resulting in modulation of mucosal immune system[9].

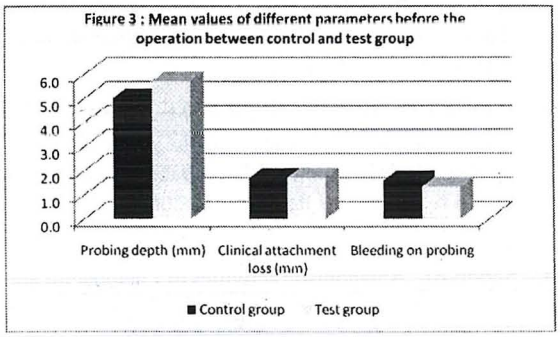
Table 2 : Paired 't' values for different parameters for before and 21 days after operation.

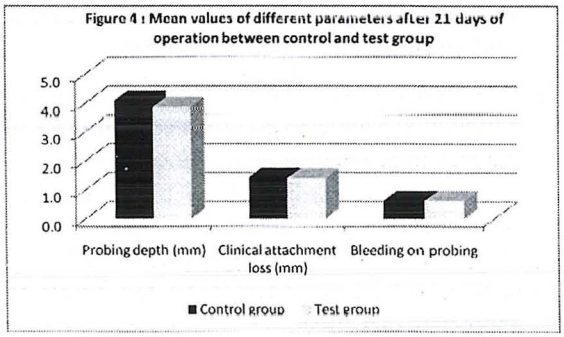
Character	Mean before operation	Mean after 21 days of operation	't' value	Probability	Significance
Control group					
Probing depth (mm)	5.03	4.10	4.06	0.000	HS
Clinical attachment loss (mm)	1.70	1.43	2.11	0.043	Sig
Bleeding on probing	1.60	0.63	6.92	0.000	HS
Test group					
Probing depth (mm)	5.73	3.87	7.39	0.000	HS
Clinical attachment loss (mm)	1.73	1.40	2.40	0.022	Sig
Bleeding on probing	1.33	0.63	6.43	0.000	HS

NS = Non-significant Sig = Significant HS = Highly significant









All the patients enrolled in this study were compliant to the regimen. No adverse effects in the form of any rashes or allergic reactions were reported by any of the patients. Improvement in clinical parameters (PPD, CAL & BOP) was found to be statistically significant in both the groups i.e. test and control group. Significant reduction in clinical parameters has also been reported by Shimauchi et al (2008)[3] and Mayanagi et al (2009)[10]. Krasse et al (2006)[11] first showed decreased gingival bleeding and reduced gingivitis scores by administration of L. reuteri. Iwamoto et al[7] concluded in their study that oral administration of probiotic lactobacilli improved physiologic halitosis and also showed beneficial effects on bleeding on probing from the periodontal pocket. However, when both groups were compared, results were found to be statistically non-significant. Some of the possible explanations for this observation can be:

1. Mechanical therapy has been accepted as a gold standard for management of periodontal disease. Statistically significant improvements in clinical parameters in both the groups can be attributed to the reduction in inflammation due to mechanical therapy. However, the small sample size employed in this study may have masked the contribution of probiotics.
2. Hawthorne effect[10] i.e. attention bias is a systematic change in behavior of the patients participating in a study wherein the control group patients also improve their oral hygiene-behavior subconsciously. Niv et al (2005)[13] have reported improvements in symptoms of irritable bowel syndrome patients in the control group, thereby suggesting a strong placebo effect.
3. Most of the earlier studies have used probiotics in the form of tablets, lozenges or chewing gums. In our study, we have employed a probiotic rinse in the hope of achieving a uniform oral effect. However, since the rinse cannot reach the base of the periodontal pockets, microbes present there remain unaffected. Controlled and sustained delivery mechanisms need to be employed so as

to deliver the probiotics in the subgingival environment.

4. Duration, mode of delivery, types and concentration of probiotics to be used in oral cavity have yet to be standardized due to insufficient clinical data. When compared to their use in GIT, oral probiotics may need certain modifications e.g. oral probiotics should adhere to and colonise on dental tissues. They should not ferment sugars which is a definitive concern about employing lactobacilli which produce lactic acid posing an increased caries risk[12].
5. It is well established that the re-emergence of periodontal pathogens is correlated with a lack of clinical improvement and an increased risk of disease relapse. Effect of probiotics on recolonisation of periodontal pathogens may be observed over a much longer period. A 21 day postoperative period may be too small to appreciate this effect.

Conclusion

To date the contribution of mechanical therapy and probiotics has not been addressed as a treatment protocol for chronic periodontal disease. This study was an attempt to determine the clinical effects of probiotics in chronic periodontitis cases. Considering the limitations of this pilot study, large scale double blind randomized placebo controlled clinical trials are need of the hour. Salivary microbiological evaluation would further substantiate the results of these studies.

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