



## EVALUATION OF EFFECTIVENESS OF BENEFICIAL BACTERIA IN THE TREATMENT OF MODERATE TO SEVERE CHRONIC PERIODONTITIS - A CLINICAL STUDY

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### ABSTRACT

**Aims and Objectives:** It is well known that the beneficial bacteria can suppress the emergence of pathogenic bacteria, particularly in the gastrointestinal tract. Although there is strong evidence suggesting potential effect of probiotics in the prevention of dental caries, its role in the treatment of periodontal disease is not clear. Therefore, the aim of this split mouth, controlled clinical trial was to evaluate the efficacy of beneficial bacteria (*lactobacilli* and *bifidobacterium*) as an adjunct to SRP in the treatment of moderate to severe chronic periodontitis. **Material and methods:** 44 sites with range of PPD 5-7mm in 10 chronic periodontitis patients (mean age of  $42.7 \pm 5.36$  years) were treated in the present study. In each patient, 2-3 sites in one quadrant were treated by SRP+Probiotic (Test sites) while 2-3 sites in the contralateral quadrant were treated by SRP alone (Control sites). Plaque index, Papillary bleeding index (PBI), Probing pocket depth (PPD), clinical attachment level (CAL), and gingival recession were recorded at baseline and at 3 months after therapy. **Results:** After 3 months, patients treated with SRP+Probiotic showed a significant mean CAL gain of 2.34mm than patients treated with SRP alone 1.32mm. PPD reduction in SRP+Probiotic was significantly greater (2.77mm) compared to SRP alone (1.63mm). **Conclusion:** Subgingival application of probiotics adjunct to SRP showed significant improvement in all clinical parameters tested indicating beneficial effect of probiotics in periodontal therapy.

**KEYWORDS:** Periodontal Pocket, Probiotics, Scaling and root planing.

### INTRODUCTION

Periodontal disease is largely associated with the imbalance of indigenous microflora resulting in overgrowth of periodontal pathogens such as Porphyromonas gingivalis, Prevotella intermedia and Actinobacillus actinomycetemcomitans.<sup>[1]</sup> Therefore the treatment of periodontal disease focuses mainly on the reduction of the bacterial threat. Conventional periodontal treatment involves mechanical subgingival debridement which results in 2-3 log<sub>10</sub> reductions in the total subgingival microbiota.<sup>[2]</sup> However, recolonization towards pre-treatment levels, primarily by bacteria less strongly implicated as periodontal pathogens, occurs within weeks<sup>[3]</sup> & reestablishment of a more pathogenic microbiota occurs within months.<sup>[4]</sup> Molars i.e. multirooted teeth do not respond as well as single rooted teeth to mechanical debridement.<sup>[5]</sup> Scaling and root planning have been shown to be less efficient in removing plaque and microorganisms from deeper sites. The use of a locally delivered antibiotic as an adjunct should be particularly effective in these sites of

periodontal therapy is temporary.<sup>[6]</sup> Additionally, increasing levels of antibiotic-resistant bacteria favour the development of approaches that do not rely on antibiotics.

Beneficial bacteria have been extensively studied for their health promoting effect.<sup>[7]</sup> The main field of research has been in the gastrointestinal tract. In the past few years beneficial bacteria (probiotics) have been investigated for periodontal health. These studies have shown that certain gut bacteria can exert beneficial effects in the oral cavity by inhibiting pathogenic species. The concept of periodontal replacement therapy first proven by Teughels et al (2007)<sup>[8]</sup> consists of applying beneficial oral bacteria subgingivally to prevent recolonization of periodontal pocket by pathogens after scaling and root planning.

Although, large numbers of different bacteria have been suggested beneficial bacteria (probiotic), the most widely used species belonging to the genera Lactobacillus and Bifidobacteria. Recently in vitro it has been shown that

some lactobacillus species and streptococci possess antimicrobial activity against periodontal pathogens such as *P.gingivalis* and *P.intermedia*.<sup>[9]</sup>

The data are still sparse and thus more information is needed on beneficial effects of probiotics during periodontal therapy. Therefore aim of the present split mouth, controlled clinical trial was to evaluate the effectiveness of beneficial bacteria (lactobacilli and bifidobacterium) in combination with SRP for the treatment of chronic periodontitis with the following objectives:

- a) To evaluate the effectiveness of beneficial bacteria in combination with SRP in terms of gain in CAL and PPD reduction.
- b) To compare the effectiveness of beneficial bacteria in combination with SRP with that of SRP alone in terms of gain in CAL and PPD reduction.

## METHODS AND MATERIALS

A total of 20 patients, aged 35-55years (mean age  $42.7 \pm 5.36$  years) with probing pocket depth  $\geq 5$  mm with attachment loss and bleeding on probing teeth on contra lateral sides were enrolled in the study. Patient's non-compliant to periodontal maintenance program, smokers or used any other tobacco products, patients who have undergone periodontal therapy 6months prior to study, pregnant women / Lactating mothers, patients taking any probiotic supplements were excluded from the study.

Prior to initiating this study, the purpose and design of this clinical trial was explained to the patients and informed consent was obtained. The study was approved by the ethical committee, of DMIMS (DU), Sawangi (Meghe), Wardha.

Information concerning dietary status, systemic background, oral hygiene habits, gingival and periodontal status along with other routine clinical data were recorded in specially designed chart. Patients were examined under good illumination with the help of mouth mirror, tweezers, William's graduated periodontal probe.

### Initial therapy

Initial therapy consisted of oral hygiene instructions, supra and sub gingival scaling. Plaque control instructions were repeated for each patient until 80-85% of plaque control was achieved. Re-evaluation was done 3 months following completion of initial therapy.

### Study design

The study was a split mouth, controlled clinical trial carried out over a period of 3 months. A total of 120 sites in 20 patients were found to be suitable after supragingival and subgingival scaling. Patients having 2-3 sites with a probing pocket depth of  $\geq 5$ mm in any two contralateral quadrants. One quadrant in each patient was randomly assigned to test group and control group by flip

coin method. The test sites were treated by scaling and root planning followed by subgingival application of probiotic supplements while sites in control group treated by scaling and root planing followed by irrigation with saline solution.

### Oral hygiene status

Patient's oral hygiene status was evaluated at baseline, 6 weeks and 3 months by using full mouth plaque index (FMPI)-Turesky-Gilmore-Glickman (1970) modification of Quigley-Hein (1962) index as an expression of the level of full mouth supragingival plaque accumulation and full mouth papillary bleeding index (FMPBI) (Mulhemman .H.R, 1977) as an expression of gingival inflammation.

### Clinical measurements

The following clinical parameters were measured for the assessment of the result in all the treatment groups: Probing pocket depth (PPD), Clinical attachment level (CAL), and gingival recession (GR) by using William's graduated periodontal probe. All the probing measurements were recorded only at the sites to be treated at baseline, 6 weeks and 3 months post therapy.

### Treatment group

Initial therapy was performed in all cases. Scaling and root planing was performed using Hoe scalers & standard Gracey Currettes under local anaesthesia. Instrumentation was carried out until the root surface was considered smooth and clean according to the operator's clinical judgement.

In the test group, after thorough scaling and root planing (SRP), the test site was isolated and the surrounding area was dried before placement of probiotic paste. A commercially available powder SPORLAC PLUS ® (Uni-Sankyo Ltd. Japan) containing beneficial bacteria i.e. lactobacilli and bifidobacterium species was mixed with saline to make a paste form. An 18 gauge blunt cannula was attached to the delivery syringe and probiotic paste was delivered into the periodontal pocket. Any overflow of the material was gently packed into the pocket with a moist tip of curette. The patients in both groups were instructed not to use dental floss in the treated areas for 7 days.

### Oral hygiene instructions

All patients were given verbal and written instructions to use toothbrush in a modified Bass technique with toothpaste additionally they were informed not to take any antibiotics and anti-inflammatory drugs or chlorhexidine based mouth wash during the entire course of the study. All the clinical parameters- Plaque index (PI), Papillary bleeding index (PBI), Probing pocket depth (PPD), Clinical attachment level (CAL), and Gingival recession, (GR) were recorded again at 6 weeks and 3months postoperatively during recall visits.

### Statistical analysis

The means and standard deviation (Mean  $\pm$  SD) values were calculated for all clinical parameters including PPD, CAL, and GR. The mean data was analysed by standard statistical methods. Students paired t-test was used to compare data from baseline to those at 3 months for each treatment group. Comparisons between treatment groups at baseline and 3 months were accomplished with students' unpaired t-test. Comparison of the PI & PBI at baseline and 3 months were made by using students paired t-test. When the probability value (p) was more than 0.05, the difference observed was considered non-significant and if less than 0.05, it was considered significant.

### RESULTS

All the 20 systemically healthy subjects were divided into two groups one quadrant in each patient was randomly assigned to test group while other to control group by flip coin method & had a total number of 120 persistent periodontal pocket sites. Test group (n=60) was treated by SRP with subgingival application of probiotics while control group (n=60) was treated by SRP alone. None of the selected patients dropped out before the termination of the study.

Throughout the study period all patients showed good oral hygiene. For control site baseline, full mouth plaque score (PI) was  $0.87 \pm 0.09$  which was decreased to  $0.58 \pm 0.1$  at 3 months with reduction of 0.29, while full mouth papillary bleeding index (PBI) dropped from  $1.58 \pm 0.17$  at baseline to  $0.7 \pm 0.09$  at 3 months with reduction of 0.88 [Table 1].

For test site baseline, full mouth plaque score (PI) was  $0.85 \pm 0.1$  which was decreased to  $0.6 \pm 0.09$  at 3 months with reduction of 0.25, while full mouth papillary bleeding index (PBI) dropped from  $1.63 \pm 0.15$  at baseline to  $0.67 \pm 0.09$  at 3 months with reduction of 0.96 [Table 2].

The reduction in PI and PBI post operatively was statistically significant in both the groups.

After 3 months, patients treated with SRP+Probiotic showed a significant mean CAL gain of 2.34mm than patients treated with SRP alone 1.32mm. PPD reduction in SRP+Probiotic was significantly greater (2.77mm) compared to SRP alone (1.63mm). [Table 3,4,5,6]

### DISCUSSION

Probiotic therapy also known as replacement therapy originated over a century ago, but was largely abandon after the discovery of antibiotics. However, the emerging problem of antibiotic resistance has lead to renewed interest in bacterial replacement. The approach is recognized in the management of gastrointestinal diseases and encouraging reports have shown possibilities in the oto-oropharyngeal area.<sup>[10,11]</sup> Studies

on replacement therapy for caries prevention have revealed promising results with the use of genetically modified *Streptococcus mutans* strains.<sup>[12]</sup> The clinical trial was undertaken to evaluate the beneficial effects of mixture of *lactobacilli* and *bifidobacterium* (Probiotics) when applied subgingivally adjunct to scaling and root planing in persistent periodontal pockets of patients with moderate to severe periodontitis.

At baseline, none of the investigated parameters at treated sites in both the groups were statistically significant, thus ensuring the same starting point for the procedures tested. There was no sign of allergy, infection, or any other complication in any patient after the use of probiotics. None of the treated patients dropped out before the termination of the study and all the patients were satisfied with the treatment modalities provided to them.

Each patient participating in the study showed a good oral hygiene level and a healthy clinical gingival condition throughout the study period as indicated by the reduction in plaque index (PI) and papillary bleeding index (PBI) score. The plaque index (PI) score was low at the baseline and remained significantly low ( $<1$ ) during 3 months period. This was the result of oral hygiene instructions given to the patients during the study period. Plaque control is essential for long term stability of the clinical outcomes. Papillary bleeding index (PBI) score was significantly reduced at 3 months post-operatively, an expected finding following effective periodontal therapy.

In the present study statistically significant reductions in PPD were observed in both SRP+Probiotic (2.87mm) and SRP alone group (1.61mm) at 3 months compared with baseline values. PPD reductions observed in SRP+Probiotic was significantly greater (1.26mm) compared with SRP alone indicating beneficial effects of probiotic for pocket reduction. These results are in accordance with the Shimauchi et al (2008)<sup>[13]</sup> who also reported significant reduction of PPD compared with placebo when probiotics were administered orally.

Changes in clinical attachment level (CAL) following pocket therapy are most commonly used clinical outcome variable in nonsurgical periodontal therapy. In present study, statistically significant mean CAL gain was observed in SRP + Probiotics group (2.10mm) as well as 1.32mm in SRP group. Teughels et al (2007)<sup>[8]</sup> observed the mean CAL gain of 1.4mm in SRP + Probiotics group and 1.3mm of mean CAL gain in SRP group.

Periodontal therapy and especially non-surgical therapy is frequently associated with gingival recession, average effects that concerns to both patients and clinicians. In the present study, increase in mean GR was observed to a limited extent in both the groups: SRP+ Probiotics (0.62mm) and SRP (0.29mm) at the end of 3 months.

Greater recession was observed in test group as compared to control sites, and the difference was statistically significant ( $p > 0.05$ ) when comparison was made between test and control groups.

The greater proportion of sites showing PPD reduction and CAL gain could represent an advantage in maintenance therapy, limiting the need for surgical procedures to fewer non-responding sites and eventually extending the period between recall visits.

Nackaerts et al (2008)<sup>[14]</sup> found significant improvement in jaw bone density and alveolar bone gain in periodontal pockets that received beneficial bacteria adjunctive to SRP. However, this result can only give idea of the potential effect of the probiotics on bone regeneration as assessed on periapical radiographs.

With respect to additional benefits of Probiotics with SRP, evidenced based research has shown that the re-emergence of periodontopathogens is correlated with lack of clinical improvement and at risk for disease relapse.<sup>[15]</sup> It is well known that subgingival microbial profile is related to pocket depth.<sup>[16]</sup> Grudianov et al (2002)<sup>[17]</sup> reported that probiotics were effective for normalization of microbiota in periodontitis and gingivitis when compared with a control group. Krasse et al (2006)<sup>[18]</sup> showed decreased gingival bleeding and reduced gingivitis after administration of probiotics *Lactobacillus reuteri*. Nackaerts et al (2008)<sup>[14]</sup> showed radiologically, that the healing of periodontal pockets after scaling & root planing seems better when beneficial bacteria applied subgingivally.

## CONCLUSION

For the analysis of the results it was concluded that:

1. The use of Probiotics as an adjunct to SRP showed more favorable and statistically significant reductions in PPD and gain in CAL compared to SRP.
2. Both the treatment resulted in significant reduction of probing pocket depth (PPD), and gain of clinical attachment level (CAL).
3. Application of beneficial bacteria as an adjunct to root planing is a valid, non-antibiotic treatment approach for periodontitis.
4. Further studies including large scale controlled clinical trials are necessary to determine the utility of probiotics as an alternative approach for the treatment and prevention of periodontal diseases.

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