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Original Research Article

The effect of anti-calculus oral spray on oral hygiene status of gingivitis patients: A 6 weeks observational study

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Abstract

Aim: To investigate whether the use of an anti-calculus oral health spray as an adjunct to tooth brushing in oral hygiene.
Materials and Methods: This study had a double-blind, two-group (n = 10 each) parallel design, including a 6 weeks experimental period during which group A (Test Group) supplemented with anti-calculus oral health spray along with regular tooth brushing, as compared to control group B with only tooth brushing. The examination of plaque and oral hygiene index was done after 6 weeks.
Results: Group A using anti-calculus oral health spray showed significantly less plaque deposits and significantly oral hygiene index improved by 14% after 6 week of observation period with no adverse effects.
Conclusion: Anti-calculus oral health spray proved to be effective adjunct to regular tooth brushing with no adverse effects.
Keywords: Anti-Calculus, Oral Spray, Oral Hygiene, Plak buster.

1. Introduction

Dental plaque forms via an ordered sequence of events, resulting in a structurally- and functionally-organized, species-rich microbial community. [1]Once formed, the overall composition of the climax community of plaque is diverse, with many species being detected at individual sites. Molecular ecology approaches, in which 16S rRNA genes are amplified from plaque samples, have identified >600 bacterial and Archae taxa, of which approximately 50% are currently unculturable. [2]

Much oral pathology, such as dental caries, periodontal disease and peri-implantitis are plaque-related. Dental plaque is a microbial biofilm formed by organisms tightly bound to a solid substrate and each other by means of an exopolymer matrix. Bacteria exhibit different properties when contained within a biofilm. [3] Oral health is influenced by oral microbial floras, which are concentrated in dental plaque. Dental plaque provides a microhabitat for organisms and an opportunity for adherence of the organisms to either the tooth surface or other microorganisms. [4] Continuous mineralization of dental plaque will lead to sequential formation of dental calculus which is frequent in all ages from adolescence to old age. [5] Correct diagnosis of the presence and extent of subgingival calculus is important for periodontal treatment planning and reassessment after periodontal therapy. [6] Calculus formation is the result of petrification of dental plaque biofilm, with mineral ions provided by bathing saliva or crevicular fluids. Research suggests that subgingival calculus, at a minimum, may expand the radius of plaque induced periodontal injury. Removal of subgingival plaque and calculus remains the cornerstone of periodontal therapy. Supragingival calculus formation can be controlled by chemical mineralization inhibitors, applied in toothpastes or mouth rinses. These agents act to delay plaque calcification, keeping deposits in an amorphous non-hardened state to facilitate removal with regular hygiene. [7] Dental plaque biofilm cannot be eliminated; however pathogenic nature of dental plaque can be eliminated by reducing the bio-burden and maintaining a normal flora with appropriate oral hygiene methods. [8]

Hence this study was aimed to evaluate whether supplementing anti-calculus oral spray along with toothbrushing will improve oral hygiene or not.

2. Material and methodology

2.1 Study Group

The present study was coordinated by Innovative Biological Research (INNBIORES) Center, Pune, India. After an informed consent, a total 20 subjects were enrolled in the study, it was a randomized, and double blinded clinical study. 20 adults who meet the inclusion and exclusion criteria were divided under two categories; each group was finally comprised of 10 subjects each for evaluation (Table 1).

2.2 Parameters Evaluated

2.2.1 Plaque Index: (Silness and Loe)

Plaque was assessed on the distal, facial, mesial, lingual or palatal area of each tooth. These areas were assigned a score between 0 and 3. Plaque score for a tooth was obtained by totaling the score for each area and dividing by 4. Plaque score per person was obtained by adding plaque score for each tooth and dividing by the total number of teeth examined.

Score	Criteria
0	No plaque
1	A film of plaque adhering to the free gingival margin and adjacent area of teeth. The plaque may be recognized by running the explorer across the tooth surface.
2	Moderate accumulation of soft deposits within the gingival pocket or on the tooth and gingival margin that can be seen with the naked eye.
3	Abundance of soft matter within the gingival pocket and or on the tooth and gingival margin.

Plaque Index (PI) Score per Person =

$$\frac{\text{Total Plaque Score}}{\text{No. of surfaces examined}}$$

Table 1: Analysis of PI score

Score Range	Interpretation
0.0	Excellent
0.1 to 0.9	Good
1.0 to 1.9	Fair
2.0-3.0	Poor

2.2.1 Simplified Oral Hygiene Index (Greene and Vermillion)

The Simplified Oral Hygiene Index (OHI-S) has two components, the Debris Index and the Calculus Index. Each of these indexes, in turn, is based on numerical determinations representing the amount of debris or calculus found on the preselected tooth surfaces. In the posterior portion of the dentition usually the first molar (16, 26, 36 and 46) but sometimes in case of missing teeth we can consider the substitution second or third molar is examined. The buccal surfaces of the selected upper molars and the lingual surfaces of the selected lower molars are inspected. In the anterior portion of the mouth, the labial surfaces of the upper right (11) and the lower left central incisors (31) are scored. In the absence of either of these anterior teeth, the central incisor (21 or 41 respectively) on the opposite side of the midline is substituted.

Table 2: Criteria for classifying debris:

Scores	Criteria
0	No debris or stain present
1	Soft debris covering not more than one third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered
2	Soft debris covering more than one third, but not more than two thirds, of the exposed tooth surface.
3	Soft debris covering more than two thirds of the exposed tooth surface.

$$\text{Debris Index} = \frac{\text{(The buccal-scores) + (The lingual-scores)}}{\text{Total number of examined buccal and lingual surfaces}}$$

Table 3: Criteria for classifying calculus:

Scores	Criteria
0	No calculus present
1	Supragingival calculus covering not more than third of the exposed tooth surface.
2	Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
3	Supragingival calculus covering more than two third of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth or both.

$$\text{Calculus Index} = \frac{\text{Buccal-scores + The lingual-scores}}{\text{Total number of examined buccal and lingual surfaces}}$$

Table 4: Inference of DI-S and CI-S score:

0.0 to 0.6	Good
0.7 to 1.8	Fair
1.9 to 3.0	Poor

Table 5: Inference of OHI-S score: Debris Index + Calculus Index

0.0 to 1.2	Good
1.3 to 3.0	Fair
3.1 to 6.0	Poor

3. Results

The mean value of plaque index in Group A at baseline was 2.74 ± 0.20. The mean value of plaque index in Group B at baseline was 2.75 ± 0.28. By applying Student t Test, the means of Group A and Group B are not significantly different at $p < 0.05$. The absolute value of the calculated t is smaller than critical value (0.0901<2.101), so the means are not significantly different. The mean value of plaque index in Group A at six weeks was 0.97 ± 0.27.

The mean value of plaque index in Group B at six weeks was 1.1 ± 0.27. By applying Student t Test, the means of Group A and Group B are not significantly different at $p < 0.05$. The absolute value of the calculated t is smaller than critical value (1.0571<2.101), so the means are not significantly different. The mean value of oral hygiene index in Group A at baseline was 3.7 ± 0.25. The mean value of oral hygiene index in Group B at baseline was 3.73 ± 0.30. By applying Student t Test, the means of Group A and Group B are not significantly different at $p < 0.05$. The absolute value of the calculated t is smaller than critical value (0.2405<2.101), so the means are not significantly different. The mean value of oral hygiene index in Group A at six weeks was 1.19 ± 0.41. The mean value of oral hygiene index in Group B at six weeks was 1.69 ± 0.24. By applying Student t Test, the means of Group A and Group B are significantly different at $p < 0.05$. The absolute value of the calculated t exceeds the critical value (3.3058>2.101), so the means are significantly different (Graph I and II).

Table 6: Study categorization

Groups	Clinical Protocol
Group A	Comprised of 10 subjects with moderate to severe gingivitis. Professional cleaning done and followed by instructions to follow: Toothbrushing: 2 times/day and Oral health spray (Plakbuster, Periogen, USA), 3 times/day.
Group B	Comprised of 10 subjects with moderate to severe gingivitis. Professional cleaning done and followed by instructions to follow: Toothbrushing: 2 times/day

Figure I: Group A Vs B: Base Line

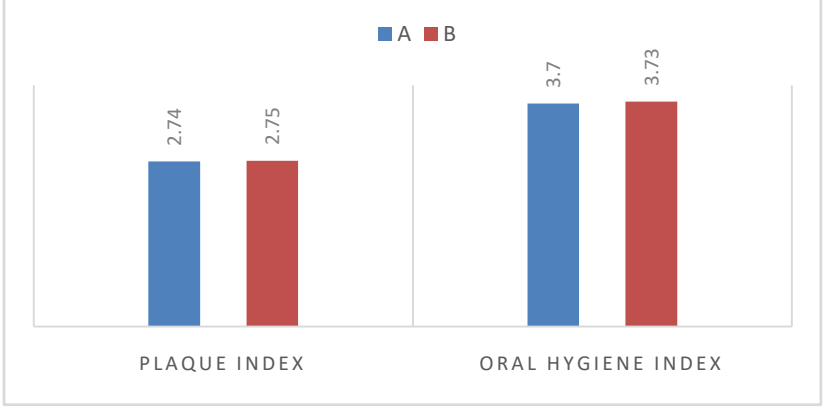
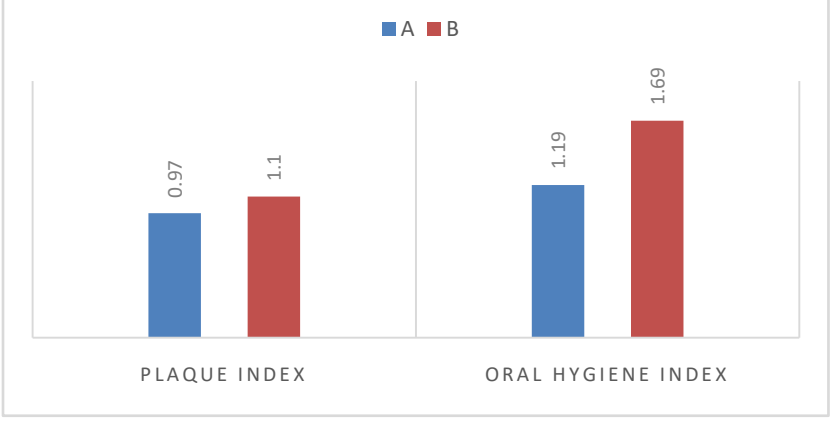


Figure II: Group A Vs B: 6 Weeks



4. Discussion& conclusion

The level of oral hygiene significantly impacts the makeup of the oral microbiome. Individuals with good oral hygiene tend to have a simple flora dominated by gram-positive cocci and rods and some gram-negative cocci, while those with poor oral hygiene have a shift to a more diverse and complex flora dominated by anaerobic gram-negative organisms. [9]

The mouth is one of the most heavily colonised parts of our bodies. Several distinct habitats within the oral cavity support heterogeneous microbial communities that constitute an important link between oral and general health. Treatment sessions should include prevention strategies and good oral hygiene to control the total microbial load is important to prevent dissemination to other body sites. [10]

Anti-calculus spray will be a potential adjunct in improving oral hygiene when supplemented with regular toothbrushing. In this study there was 4.59% improvement in plaque index and 13.14% in oral hygiene index in Group A using oral health spray (Plakbuster, Periogen, USA) along with toothbrushing as compared to Group B when evaluated after 6 weeks of time.

However, considering the number of subjects and time of the study, more longitudinal studies are needed to completely understand the benefits of oral hygiene improvement with anti-calculus spray.

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