

Comparative Evaluation Between the Efficacy of Fluoride Based Toothpaste (Parodontax™) and Calcium Based Toothpaste (Colgate) on Established Gingivitis



Harleen Kaur¹, Navneet Kaur^{2*} and Gurpreet Kaur³

¹Department of Periodontics & Oral Implantology, National Dental College & Hospital, India

²Reader, Department of Periodontics & Oral Implantology, National Dental College & Hospital, India

³Professor & HOD, Department of Periodontics & Oral Implantology, National Dental College & Hospital, India

Submission: February 13, 2024; **Published:** March 13, 2024

***Corresponding author:** Dr. Navneet Kaur, Reader, Department of Periodontics & Oral Implantology, National Dental College & Hospital, Dera Bassi, Punjab, India

Abstract

Introduction: Bacteria in dental plaque are one of the main causative factors of periodontal inflammation, therefore, meticulous plaque control is very important. Self-performed mechanical plaque removal is one of the most accepted methods of controlling plaque and gingivitis. There has been a search for years for chemical agents that could help in patient-dependent mechanical plaque control and thus reduce or prevent various oral diseases. Dentifrices play an important role in plaque control and in oral hygiene maintenance. This study will be undertaken to evaluate the effectiveness of fluoride-based toothpaste (Parodontax™) as compared to calcium-based toothpaste (Colgate) on plaque control, removal of stains and in improving the signs and symptoms of gingivitis.

Aim & Objective: To evaluate the effectiveness of fluoride-based toothpaste (Parodontax™) for the improvement of oral hygiene and the reduction of gingival inflammation in patients with established gingivitis, as compared to a calcium-based toothpaste (Colgate).

Materials and Methods: A total of 6 systematically healthy patients in the age group of 18-45 years with established gingivitis were randomly selected after undergoing professional cleaning and divided into 2 groups. Group 1: Patients received fluoride-based dentifrice (Parodontax™) after SRP. Group 2: Patients received calcium-based toothpaste (Colgate) after SRP. All the patients used the allocated dentifrice, twice a day for 6 weeks. All the clinical parameters such as Plaque index, Gingival index and sulcular bleeding index were assessed at baseline and on 45th day.

Results: The result showed an improvement in all clinical parameters such as PI, GI and SBI in both study groups when measured at baseline and after 45 days. However, the statistical analysis was found to be statistically non-significant ($p > 0.05$).

Conclusion: Based on the result of the study it can be concluded that both dentifrices have similar effects on plaque control, gingival inflammation and bleeding on probing. However, long term studies with large sample size are required to compare and evaluate the efficacy of fluoride-based toothpaste (parodontax™) and calcium-based toothpaste (colgate) on established gingivitis.

Keywords: Established gingivitis; Gingival inflammation; Dentifrices; Plaque control; Oral hygiene

Abbreviations: PI: Plaque Index; GI: Gingival Index; SBI: Sulcular Bleeding Index

Introduction

There is a complex organization of colonies of plaque biofilm and is attributed to the transition from oral health to disease and the pathogenicity of biofilm is inherently reduced through effective oral hygiene measures [1]. Gingivitis is typically

diagnosed through the presence of inflammation in the gingival tissue and absence of clinical attachment loss [2] Inflammation is innate body reaction to cellular injuries and oral inflammation may result in change in the gingival color, contour and consistency. If gingival inflammation is not reversed through oral hygiene or

professional prophylaxis, it may result in periodontal disease [3]. Dental plaque is one of the main factors that causes periodontal inflammation therefore careful plaque control is very important. Elimination of microbial dental plaque biofilm helps in prevention of gingivitis, periodontitis, and dental caries. Although brushing teeth twice a day and daily flossing is highly effective in plaque reduction, over 50% of adults have gingivitis on an average of 3-4 teeth [4]. The rationale behind the control of bacterial plaque is the use of antimicrobial dentifrices in addition to their mechanical oral hygiene regimes.

A number of controlled clinical trials have demonstrated that toothbrushing with additional use of dentifrices reduces the supragingival plaque and gingivitis [5]. An antimicrobial dentifrice can be used as an adjunct to mechanical oral hygiene regime. Although mechanical plaque control is time consuming procedure, and some individuals may lack motivation for maintenance of good oral hygiene. Recently research has been done on various mouth rinses and dentifrices based on their action and their content which is present in the dentifrices. Dentifrices are designed to act in a topical manner that is acting locally within the mouth on the surface of the teeth. The most common sources of fluoride in toothpastes are sodium fluoride and sodium monofluorophosphate. Sodium fluoride is more effective and sodium monofluorophosphate is more compatible with a wider range of ingredients and is less expensive [6]. The main function of fluoride is to prevent dental caries.

Many studies have also demonstrated the profound effect of fluoride on enamel demineralization and remineralization with regular use of even with low level of fluoride [7]. The fluoride ion in dental plaque immediately promotes the formation of fluorapatite in the presence of phosphate and calcium ion produced during demineralization of tooth enamel by plaque bacterial organic acid. Fluoride ion also promotes the remineralization of previously demineralized enamel if salivary or plaque calcium and phosphate ions are available in adequate amount only when the fluoride is applied [8]. Other effects of fluoride include the inhibition of glycolysis and reducing the production of extracellular polysaccharides in plaque bacteria. In addition, fluoride is bactericidal in high concentration and has an effect on cariogenic effect of streptococcus mutans.

Parodontax (Glaxo Smith Kline, Middlesex, United Kingdom) has recently received more attention as compared to other dentifrices. The efficacy of parodontax in gingivitis patients was first reported by Rudolf and Focke in 1937 [9]. Parodontax has the property of antibacterial, buffering capacity and cleansing action. The commercial product of fluoride-based dentifrice, Parodontax is composed of Sodium Bicarbonate, Aqua, Glycerin, Sodium Lauryl Sulfate, Aroma, Xanthan Gum, Cocamidopropyl Betaine, Sodium Fluoride (927), Sodium Saccharin, Titanium Dioxide, Steviol Glycosides, Limonene. Sodium bicarbonate effectively removes the dental biofilm from the environment by disrupting

the mature plaque and neutralizing the PH of the saliva [10]. Clinical studies have documented the antibacterial. Anti-plaque, anti- gingivitis and anti-inflammatory effectiveness of parodontax dentifrice and their associated product. The result of clinical trials in literature on established gingivitis is based on the composition of dentifrices specially fluoride component, PH of the saliva and host immune response of the body. Therefore, the present study was conducted to evaluate the effectiveness of fluoride-based toothpaste (Parodontax™) for the improvement of oral hygiene and the reduction of gingival inflammation in patients with established gingivitis, as compared to a calcium-based toothpaste (Colgate).

Materials and Methods

Study population

For the proposed study, a total of 6 patients were selected from the outpatient department of Periodontics and Oral Implantology, National Dental College & Hospital, Derabassi, Punjab. An ethical approval for the study was obtained from the Institutional Ethical Board Committee and a detailed verbal and written consent was taken from each of the patients. Patients were allocated randomly into two study groups (3 in each group) Group 1 Patients received fluoride-based toothpaste (Parodontax™) after SRP and Group 2 Patients received calcium-based toothpaste (Colgate) after SRP

Inclusion criteria

- I. Patients between the age group of 18-45 years.
- II. Baseline Plaque Score mean > 1.5
- III. Gingival index > 1.0
- IV. Signs of gingival inflammation

Exclusion criteria

- I. Advanced periodontal inflammation
- II. Fixed orthodontic appliances
- III. Malocclusion (crowding) in the teeth
- IV. Anti-inflammatory medicines or antibiotic therapy less than 1 month before the study.
- V. Pregnant women
- VI. Lactating mothers

Methodology

Clinical parameters were recorded at baseline. All patients underwent full mouth scaling using ultrasonic scalers and hand instrumentation. A total of 6 Patients were allocated randomly into two study groups:

Group 1: Patients received fluoride-based dentifrice (Parodontax™) after full mouth scaling and root planning.

Group 2: Patients received calcium-based toothpaste (Colgate) after full mouth scaling and root planning. Oral hygiene instructions were given to all the study patients after the intervention. The patients were instructed to brush twice a day using their respective dentifrices.

Assessment of clinical parameter

Clinical parameters included the assessment of Plaque index (PI) Silness & Loe (1964). Gingival index (GI) Loe & Silness (1963) and Sulcular bleeding index developed by Muhlemann HR and Son S in 1971 were recorded at baseline and after 45th day of intervention.

Statistical Analysis

The parameters were tabulated and put to statistical analysis. The data for the present study was entered into Microsoft Excel 2007 and analyzed using the SPSS statistical software 23.0

Version. The descriptive statistics included mean, standard deviation frequency and percentage. The intragroup comparison for the different time intervals was done using Paired t-tests to find the difference between the individual time intervals. The level of the significance for the present study was fixed at 5%. The intergroup comparison for the difference of mean scores between independent groups was done using the one-way ANOVA and Post Hoc Tukey Analysis.

Results

(Table 1) The intergroup comparison of the plaque Index (PI), Gingival index (GI) and Sulcular bleeding index (SBI) between the time intervals i.e. at Baseline and 45th day was statistically non-significant for both groups i.e. Group 1 (fluoride-based toothpaste parodontax™) after SRP and Group 2 (calcium-based toothpaste Colgate) after SRP (Figure 1-3).

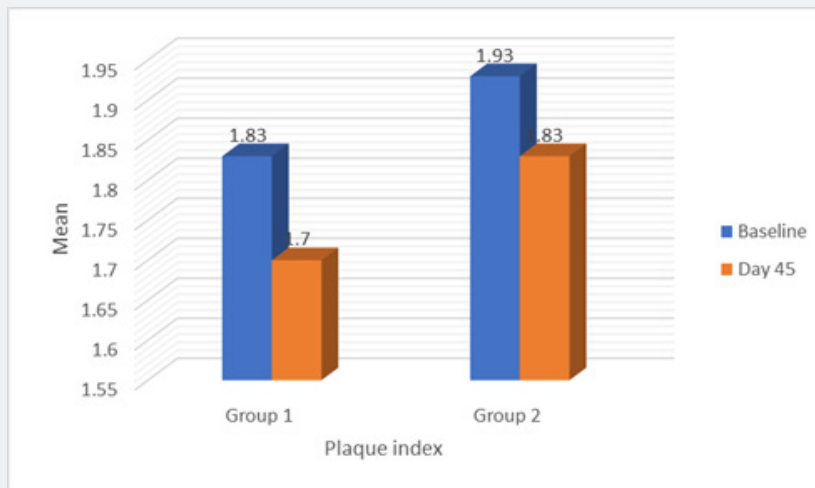


Figure 1: Intergroup Comparison of Plaque Index at baseline and after 45th day.

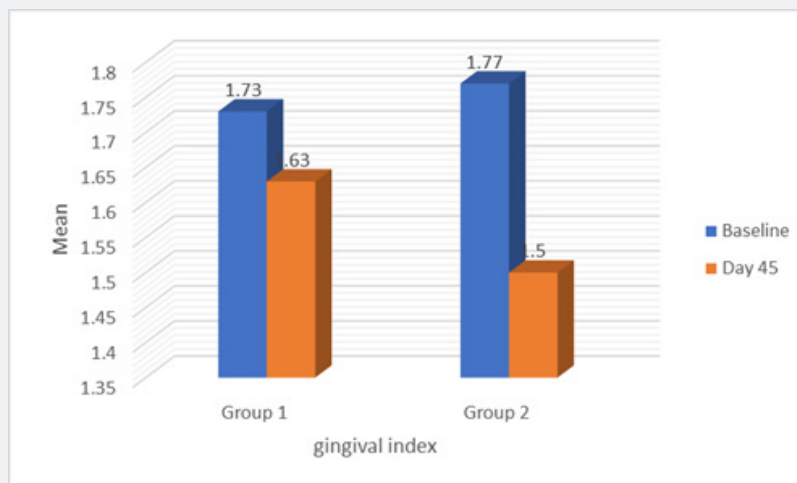


Figure 2: Intergroup Comparison of Gingival Index at baseline and after 45th day.

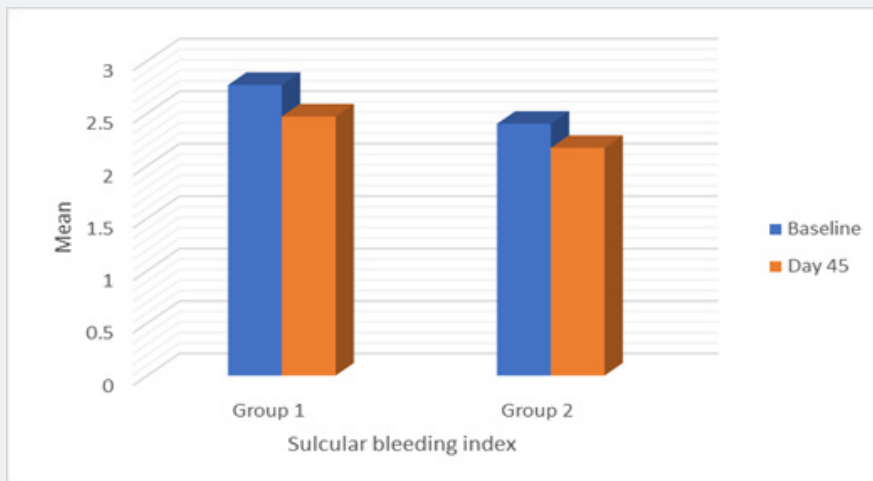


Figure 3: Intergroup Comparison of Sulcular Bleeding Index at baseline and after 45th day.

Table 1: Comparison of all clinical parameters at various time intervals.

	Plaque Index (Mean ± SD)		Gingival Index (Mean ± SD)		Sulcular Bleeding Index Score (Mean ± SD)	
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
AT Baseline	1.83± 0.23	1.93± 0.25	1.73± 0.06	1.77± 0.21	2.77± 0.64	2.40± 0.89
45th Day	1.70± 0.17	1.83± 0.25	1.63± 0.06	1.50± 0.10	2.47± 0.67	2.17± 0.74
P value	0.678*	0.547*	0.826*	0.270*	1.441*	0.286*

*P value >0.05 (statistically non-significant).

Discussion

The inflammatory response from experimental gingivitis is primarily due to microbial plaque accumulation. The dental plaque is considered to be the one of the primary etiological factors for dental diseases. The formation of plaque induced biofilm on the tooth surface is characterized by the progression of pioneer microbial species to the complex flora of mature dental plaque induced biofilm. There is an initial adherence of bacteria to the salivary pellicle and subsequent accumulation inter-bacterial species around the soft tissue wall and form the aerobic and anerobic colonies in the biofilm. Ultimately, the tooth surface gets coated with a dense, complex micro-community that ends up in the destruction of hard enamel tissue [11]. Micro-organisms play a significant role in the causation of dental problems. Studies have suggested the combined use of both mechanical and chemical therapy as the most efficient way in bringing down gingival inflammation. Various chemico therapeutic agents have been incorporated into dentifrice formulation to prevent and reduce gingivitis and dental caries.

Various chemotherapeutic agents have been incorporated as an ingredient of dentifrices and have shown the property of anti-plaque anti gingivitis. Triclosan, stannous salts, and zinc salts

along with fluoride and calcium are the main ingredients of any dentifrice. Fluoride is primarily known for its adherence to the tooth surface and its incorporation into the pellicle and dental plaque [12]. Studies on the interaction of fluoride content with oral soft tissues are very scant, which may be an experimental design challenge for future research. However, oral soft tissues are probably the main oral reservoir for fluoride. Another dentifrice ingredient is calcium phosphate. A range of calcium phosphate technologies has been developed to enhance the ability of fluoride to promote remineralization [13,14]. Dentifrices with only fluoride re-mineralize predominantly the surface layer of a caries lesion. Dentifrice with added calcium phosphate technologies remineralize the body of the lesion.

Ingredients in dentifrice that aim to inhibit calcium phosphate deposits to prevent the development of calculus are mainly pyrophosphates. Dentifrices are an ideal vehicle for the delivery of therapeutic agents because they are ubiquitously used during routine tooth brushing. They can be formulated to support user compliance with recommended brushing instructions [15]. The present study was conducted to evaluate the effectiveness of two commercially available fluoride-based toothpaste (Parodontax™) and calcium-based toothpaste (Colgate) in the reduction of

gingival inflammation in patients with established gingivitis and improved oral hygiene status. The clinical parameters recorded were Plaque index, Gingival index and sulcular bleeding index at baseline and on 45th day. In the present study the mean plaque index score has reduced in group 1 (Parodontax™) as compared to group 2 (Colgate) at baseline and 45th day of intervention. However, the result was found to be statistically non-significant.

The study's findings are in agreement with earlier research conducted by Ladder RG et al. [16], Varanic E et al. [17] which compare the conventional and herbal dentifrices and showed a considerable reduction in plaque index score but no statistical difference. by the use of conventional dentifrice. The mean gingival index score has reduced in group 1 (Parodontax™) as compared to group 2 (Colgate) at baseline and the mean gingival index score was found to be more in group 1 (Parodontax™) as compared to group 2 (Colgate) after 45th day of intervention. However, the result was found to be statistically non-significant. The antimicrobial effect of fluoride based Parodontax™ was more to inhibit the proliferation of a limited number of known periodontal pathogens when compared to a standard of care calcium-based dentifrice Colgate. Previous studies of Colgate have conveyed evidence of the antimicrobial and anti-inflammatory effect of this dentifrice on gingivitis reduction, plaque control, and periodontal health [18,19].

In the present study, the mean sulcular bleeding index score has reduced in group 1 (Parodontax™) as compared to group 2 (Colgate) at baseline and the mean sulcular bleeding index score was found to be more in group 1 (Parodontax™) as compared to group 2 (Colgate) after 45th day of intervention. However, the result was found to be statistically non-significant. A similar study was conducted by Yankell SL [20] and Saxer et al. [21] who assessed the bleeding sites with periodontal probe and the result was found to significant decrease in the bleeding sites by the use of Parodontax dentifrice over a period of 4 weeks [20,21]. In this study no adverse effect was noted on the oral hard and soft tissues after the use of dentifrice. Although the use of interdental cleaning aids and use of mouthwash was not advised during the time period of the study. Because of the small sample size and shorter follow up time period, further longitudinal clinical studies are required to determine the effectiveness of dentifrices and to determine any buildup of microbial resistance and reduction seen in the gingival inflammation or nearly a reduction in plaque level at a larger study population.

Conclusion

On the basis of the results of this study, it can be concluded that tooth brushing with fluoride containing Parodontax dentifrice can reduce gingival inflammation and both PI and sulcular bleeding index scores effectively when compared with calcium-based Colgate dentifrice in all the study subjects. It can be a possible alternate to Colgate dentifrice in the management of gingivitis.

References

- Liu Z, Zhang W, Zhang J, Zhou X, Zhang L, et al. (2012) Oral Hygiene, Periodontal Health and Chronic Obstructive Pulmonary Disease Exacerbations. *J Clin Periodontol* 39(1): 45-52.
- Research, Science and Therapy Committee (52003) Position Paper: Diagnosis of Periodontal Disease. *J Periodontol* 74(8): 1237-1247.
- Gurenlian JR (2009) Inflammation: The Relationship Between Oral Health and Systemic Disease. *Dent Assist* 78(2): 8-10.
- Abdulwahab I, Kholani Al (2011) Comparison between the Efficacy of Herbal and Calcium based Dentifrices on Established Gingivitis. *Dent Res J* 8(2): 57-63.
- Barnett ML (2003) The Role of Therapeutic Antimicrobial Mouthrinses in Clinical Practice: Control of Supragingival Plaque and Gingivitis. *J Am Dent Assoc* 134(6): 699-704.
- Stamm J (1995) Clinical Studies of Neutral Sodium Fluoride and Sodium Monofluorophosphate Dentifrices. In: Bowen WH (Ed.), London, UK: Royal Society of Medicine Press Limited, pp. 43-58.
- Lynch RJ, Navada R, Walia R (2004) Low-levels of Fluoride in Plaque and Saliva and their Effects on the Demineralisation and Remineralisation of Enamel; Role of Fluoride Toothpastes. *Int J Dent* 54(5 Suppl 1): 304-309.
- Reynolds EC (2008) Calcium Phosphate-based Remineralization Systems: Scientific Evidence? *Aust Dent J* 53(3): 268-273.
- Saxer U, Jaschouz V, Ley F (1994) The Effect of Parodontax Dentifrice on Gingival Bleeding. *J Clin Dent* 5(2): 63-64.
- Pratten J, Wiecek J, Mordan N, Lomax A, Patel N, et al. (2016) Physical Disruption of Oral Biofilms by Sodium Bicarbonate and *in vitro* study. *Int J Dent Hyg* 14(3): 209-214.
- Prashant GM, Chandu GN, Murulikrishna KS, Shafiulla MD (2007) The Effect of Mango and Neem Extract on four Organisms Causing Dental Caries: *Streptococcus mutans*, *Streptococcus salivarius*, *Streptococcus mitis*, and *Streptococcus sanguis*: An *in vitro* Study. *Indian J Dent Res* 18(4): 148-151.
- Kirsch J, Hannig M, Winkel P, Basche S, Leis B, et al. (2019) Influence of Pure Fluorides and Stannous Ions on the Initial Bacterial Colonization *in situ*. *Sci Rep* 9(1): 18499.
- Shen P, Fernando JR, Yuan Y, Walker GD, Reynolds C, et al. (2021) Bioavailable Fluoride in Calcium-Containing Dentifrices. *Sci Rep* 11(1): 146.
- Shen P, Walker GD, Yuan Y, Reynolds C, Stanton DP, et al. (2018) Importance of Bioavailable Calcium in Fluoride Dentifrices for Enamel Remineralization. *J Dent* 78: 59-64.
- Tonetti MS, Bottenberg P, Conrads G, Eickholz P, Heasman P, et al. (2017) Dental Caries and Periodontal Diseases in the Ageing Population: Call to Action to Protect and Enhance Oral Health and well-being as an Essential Component of Healthy Ageing—Consensus Report of group 4 of the joint EFP/ORCA Workshop on the Boundaries between Caries and Periodontal Diseases. *J Clin Periodontol* 44(Suppl 18): S135-S144.
- Ladder RG, Latimer J, Humphreys GJ, Sreenivasan PK, McBain AJ (2014) Bacteriological Effects of Dentifrices with and without Active Ingredients of Natural Origin. *Appl Environ Microbiol* 80(20): 6490-6498.
- Vranic E, Lacevic A, Mehmedagic A, Uzunovic A (2004) Formulation Ingredients for Toothpastes and Mouthwashes. *Bosn J Basic Med Sci* 4(4): 51-58.
- Fine DH, Sreenivasan PK, McKiernan M, Tischio-Bereski D, Furgang

- D (2012) Whole Mouth Antimicrobial Effects after Oral Hygiene: Comparison of three Dentifrice Formulations. J Clin Periodontol 39(11): 1056-1064.
19. Lang NP, Sander L, Barlow A, Brennan K, White DJ, et al. (2002) Experimental Gingivitis Studies: Effects of Triclosan and Triclosan-Containing Dentifrices on Dental Plaque and Gingivitis in three-week Randomized Controlled Clinical Trials. J Clin Dent 13(4): 158-166.
20. Yankell SL, Emling RC (1988) Two-month Evaluation of Parodontax Dentifrice. J Clin Dent (Suppl 1): 41-48.
21. U Saxer, V Jaschouz, F Ley (1994) The Effect of Parodontax Dentifrice on Gingival Bleeding. J Clin Dent 5(2): 63-64.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/GJO.2024.26.556195](https://doi.org/10.19080/GJO.2024.26.556195)

**Your next submission with Juniper Publishers
will reach you the below assets**

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats

(Pdf, E-pub, Full Text, Audio)

- Unceasing customer service

Track the below URL for one-step submission
<https://juniperpublishers.com/online-submission.php>