

Polycarbonate Bracket with Fluoridated Dentifrices – Comparative Clinical and Microbiological Study

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Abstract

Background: To ascertain if fluoridated dentifrices have an effect on Streptococcus mutans count in orthodontic patients with Polycarbonate brackets. **Material and method:** patient had tooth No's 45 included in the study with Polycarbonate bracket bonded. Dentifrices tested were Fluoride based. Conventional tooth paste was considered as control group. **Result:** Paired T test compared the means of Streptococcus mutans count around Polycarbonate bracket at different time intervals. **Conclusion:** This shows Polycarbonate bracket has statistically significant reduction of Streptococcus mutans with Fluoride toothpaste.

Keyword: Polycarbonate, Fluoride, Streptococcus Mutans.

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INTRODUCTION

The most common Colgate contains Fluoride. Fluoride acts primarily via topical mechanisms and brings about inhibition of demineralization enhancement of remineralization at the crystal structure and inhibition of bacterial enzyme. Marsh and Bradshaw [1] found that 19 ppm of fluoride in an in vitro mixed culture study inhibited the growth of Streptococcus mutans. As bacteria in dental plaque is one of the main factors causing periodontal inflammation; careful plaque control is very important. The extrinsic variables affecting the bacterial count (besides the confounding intrinsic host factors) may be considered to be the type of tooth brush used by the patient and the method of brushing, the effect of the dentifrice used and the quality and quantity of orthodontic attachments in the oral cavity. Streptococcus mutans is a potent initiator of caries because there are a variety of virulence factors unique to the bacterium and play an important role in caries initiation. Firstly, Streptococcus mutans is an anaerobic bacterium known to produce lactic acid as part of its metabolism. Secondly, there is the ability of Streptococcus mutans to bind to tooth surfaces in the

presence of sucrose by the formation of water-insoluble glucans, a polysaccharide that aids in binding the bacterium to the tooth [1]. The most important virulence factor is the acidophilicity of Streptococcus mutans. Unlike the majority of oral microorganisms, Streptococcus mutans thrives under acidic conditions and becomes the dominant bacterium in cultures with permanently reduced pH². Though, brushing teeth twice a day is considered reasonably effective in plaque and bacterial count reduction, the common prevalence of gingival inflammation in orthodontic patients often suggests inadequate oral hygiene procedures in most patients. The household name for toothpaste is often synonymous with “Colgate” in rural India to designate a dentifrice. Juvvadi [2] found a high Fluoride concentration in the oral cavity might inhibit acid production by bacteria and may reduce the number Streptococcus mutans. Hence, this study of microbiological assay of Streptococcus mutans with an objective to study the performance and measure the efficacy of Fluoride toothpastes- Fluoride based herbal toothpaste with polycarbonate Bracket is done.

AIM AND OBJECTIVES

To ascertain if Fluoride dentifrices have an effect on Streptococcus mutans count in orthodontic patients with Polycarbonate Bracket brackets.

MATERIAL AND METHOD

Nature of Study

Randomized, prospective, cross sectional single blinded microbiological assay study with each patient acting his /her own control in this study.

Area of Study

Department of Orthodontics and Dentofacial Orthopedics, Divya Jyoti College of Dental Sciences and Research and Microbiological Assay were conducted in Divya Jyoti Hospital.

Ethical Clearance

This study was approved by Institutional Committee (IEC No DJD/IEC/2014/A-001). A written consent was taken from each participating subject.

Inclusion criteria

- Patient with similar socioeconomic strata & common food habits.
- Patients free of oral/parental antibiotics for one month.
- No periodontal & systemic disorders
- Patients with no crowding and who have had alignment and leveling completed.

Dentifrices

CODES	COLOR	DENTIFRICES
X	White	Fluoride Based Toothpaste (Colgate Palmolive)

Bracket Type

S. No	Bracket type
1	Polycarbonate Rhomboidal MBT



Polycarbonate Bracket

Steps and Time Interval of Study

- Each group consists of 30 teeth with 30 brackets to be tested.
- Each patient served as his/her own control as 1 types of bracket were tested in the same mouth at the same time period.
- Each patient had tooth No's 45 included in the study with polycarbonate bracket bonded.
- Dentifrices tested were Fluoride based.
- The dentifrices were dispensed into 5ml bottles coded as X for Fluoride toothpaste -. Color Coding of Dentifrices
- Conventional tooth paste was considered as control group.

S. No	N	Type	Bracket Bonded on Tooth Number
I	30	Polycarbonate Rhomboidal MBT	45



CODES	COLOR	DENTIFRICES
X	Silverff White	Fluoride Dentifrice (Colgate Palmolive) containing fluoride.



Ice Box Plaque Collection and Transportation

Plaque collection and transportation

- Plaque sample placed in 5ml sterilized vials with 1ml distill water.
- Sterilized vials were transported in icebox to the lab.
- The bacteriological study was conducted by Dilution Plating Method.
- The growth media used was Mutans-Sanguis Agar.

Oral Hygiene Instructions

- The subjects were given oral hygiene instructions & requested to refrain from using any other oral hygiene products like mouthwash etc.
- The subjects were instructed to follow standard oral hygiene regime which included brushing twice a day with toothpaste as prescribed in the study regime.
- The patients were advised to rinse thoroughly after every meal.

Table Shows: Time Interval of Tooth Paste Usage

TOOTHPASTE	TIME INTERVAL
Baseline without use of study Dentifrices	1 st to 2 nd Day
Fluoride (X)	3 rd to 8 th Day

Table Shows: Time Interval of Plaque Collection

Sample Count	Time Interval	Day Count
Sample No.1 (baseline without use of study dentifrices)	(T ₁) (Start of study)	Day : 1
Sample No.2	T ₂	Day : 3
Sample No.3	T ₃	Day : 8

Plaque Collection Method

- Patients were requested to refrain from eating or drinking 1 hour prior to sample collection.
- Plaque sample was collected by Four Pass Technique at midmorning (11 a.m.).
- In this technique the explorer tip is moved around the circumference of the bracket at the bracket tooth interface.
- Four passes, along the tooth at the bracket interface at the gingival, mesial, distal, and occlusal aspects are done to avoid overloading the instrument tip.
- This is considered an effective method of obtaining the total plaque .Plaque samples were placed in sterilized vials having distilled water in it.

Laboratory Equipment's



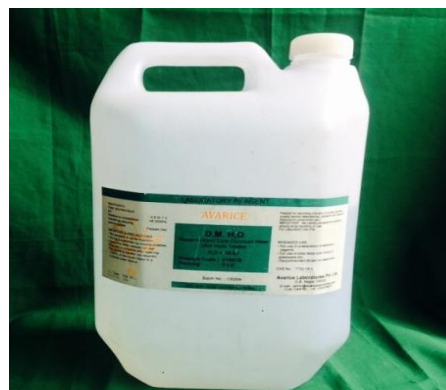
Hot Plate



Mutans Sanguis Agar



Laminar Air Flow



Distilled Water



Wire Loop



Micropipette



Incubator



Sterilization of Diluted Agar Medium in Autoclave



Spreading of Plaque Sample over Petridish



Petridishes Placed Inside Incubator



Solidification of Agar Medium in Laminar Air Flow

S.No	Item
1	Autoclave
2	Hotplate
3	Petridish
4	Micropipette
5	Laminar flow Cabinet
6	Conical flask
7	Cotton Plug
8	Sterilized Wire loop
9	Incubator
10	Disposable gloves
11	U shape flask
12	Disposable Mouth mask

RESULT

Table Shows: Comparison of Means of Streptococcus mutans Count at Different Time Intervals around Polycarbonate Bracket by Paired T – Test

Days			Mean difference	T	d.f.	P value
Day 1	-	Day 3	0.10000	0.619	29	0.541*
Day 3	-	Day 8	0.86667	4.709	29	0.000***

***Highly Significant $p < 0.001$, **Significant $p < 0.05$, *Not Significant $p > 0.05$

- Paired T test compared the means of Streptococcus mutans count around Polycarbonate bracket at different time intervals.
- Difference between Day 3 & Day 8 with Fluoride dentifrice was highly significant statistically
- Difference between Day 1 & Day 3 was not statistically significant.
- The mean difference between Day 3 & Day 8 is 0.000.

CONCLUSION

- This shows Polycarbonate bracket has statistically significant reduction of Streptococcus mutans with Fluoride toothpaste.

DISCUSSION

The increased time and difficulty of maintaining good oral hygiene during orthodontic treatment are challenges faced by patients and the levels of oral bacteria have been reported to increase five folds due to the orthodontic devices and attachments [1]. Emilson CG. Stated that most orthodontic patients are not able to perform effective plaque control, and therefore develop mild to moderate gingivitis during treatment with fixed appliances. Microorganisms play a major role in causation of WSL and dental caries. Entire removal of microorganism from the oral cavity is difficult but their count can be reduced with the help of various preventive measures so that it becomes less cariogenic. The market is flooded with numerous bracket types of different biomaterials. Literature evidences that adherence of plaque to the fixed appliance is largely contributed by the bracket material [2] as it could play a role in the degree of bacterial adhesion and plaque accumulation as well as in the risk of development of WSL. The initial affinity of bacteria to solid surfaces is due mostly to electrostatic and hydrophobic interactions. Surfaces with high surface free energy more easily attract bacteria such as S.mutans [3]. Currently Brackets are being driven by manufacturers as having a hygiene advantage, while many studies have reported in the contrary [5]. The results of the current research study showed significant reduction around Polycarbonate bracket with Fluoride toothpaste. The value of current study suggests that fluoridated dentifrices have good antimicrobial effects on caries producing bacteria, thus can be used in orthodontic patients and as a regular home care preventive aid in combating dental caries. Simultaneously, the world of cleansing agents has also widened and a fresh interest in 'organic plant based

products is on the rise as alternative medicine is widely propagated and practiced.

REFERENCES

1. Bradshaw, D. J., McKee, A. S., & Marsh, P. D. (1990). Prevention of population shifts in oral microbial communities in vitro by low fluoride concentrations. *Journal of dental research*, 69(2), 436-441.
2. Rammohan, S. N., Juvvadi, S. R., Gandikota, C. S., Challa, P., Manne, R., & Mathur, A. (2012). Adherence of Streptococcus mutans and Candida albicans to different bracket materials. *Journal of pharmacy & bioallied sciences*, 4(Suppl 2), S212.
3. Ohsumi, T., Takenaka, S., Wakamatsu, R., Sakaue, Y., Narisawa, N., Senpuku, H., & Okiji, T. (2015). Residual structure of Streptococcus mutans biofilm following complete disinfection favors secondary bacterial adhesion and biofilm re-development. *PloS one*, 10(1), e0116647.
4. Pujari, S. (2015). Bacteria Present In a Sample by Serial Dilution Agar Plating Method or Total Plate Count (TPC). *Int J Microbiology*, 6(2):101-103.
5. Little, W. A., Korts, D. C., Thomson, L. A., & Bowen, W. H. (1977). Comparative recovery of Streptococcus mutans on ten isolation media. *Journal of clinical microbiology*, 5(6), 578-583.
6. Hoover, C. I., & Newbrun, E. (1977). Survival of bacteria from human dental plaque under various transport conditions. *Journal of clinical microbiology*, 6(3), 212-218.
7. Duchin, S., & Van Houte, J. (1978). Colonization of teeth in humans by Streptococcus mutans as related to its concentration in saliva and host age. *Infection and immunity*, 20(1), 120-125.
8. Emilson, C. G. (1983). Prevalence of Streptococcus mutans with different colonial morphologies in human plaque and saliva. *European Journal of Oral Sciences*, 91(1), 26-32.
9. Wan, A. K. L., Seow, W. K., Walsh, L. J., & Bird, P. S. (2002). Comparison of five selective media for the growth and enumeration of Streptococcus mutans. *Australian dental journal*, 47(1), 21-26.
10. Yuwono, C. L., Soegiharto, B. M., & Jazaldi, F. (2013). Effectiveness of herbal and non-herbal toothpastes in reducing dental plaque accumulation. *Journal of Dentistry Indonesia*, 19(3), 70-74.