Stainless Steel Bracket with Fluoridated Dentifrices – Comparative Clinical and Microbiological study

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DOI: 10.36348/sjodr.2019.v04i09.014 | Received: 11.09.2019 | Accepted: 20.09.2019 | Published: 30.09.2019

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Abstract

Background: To ascertain if fluoridated dentifrices have an effect on Streptococcus mutans count in orthodontic patients with Stainless steel brackets. Material and method: patient had tooth No’s 12 included in the study with Stainless steel 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 Stainless steel bracket at different time intervals. Conclusion: This shows Stainless steel bracket has statistically significant reduction of Streptococcus mutans with Fluoride toothpaste.

Keywords: Stainless steel bracket, Fluoride, Streptococcus Mutans.

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 pH [2]. 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 of 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 Stainless steel Bracket is done.

AIM AND OBJECTIVES
To ascertain if Fluoride dentifrices have an effect on Streptococcus mutans count in orthodontic patients with Stainless steel 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

| S. No | N  | Type                                      | Bracket Bonded on Tooth Number |
|-------|----|-------------------------------------------|--------------------------------|
| I     | 30 | Stainless Steel Rhomboidal MBT            | 12                             |

Bracket Type

| S. No | Bracket type                                      |
|-------|--------------------------------------------------|
| 1     | Passive Stainless steel Bracket                   |
|       | [ Empower 0.22 MBT American Orthodontics]         |

Stainless steel 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 type of bracket was tested in the same mouth at the same time period.
- Each patient had tooth No’s 12 included in the study with ceramic 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 toothpaste was considered as control group.
Plaque collection and transportation
- Plaque sample placed in 5ml sterilized vials with 1ml distilled 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.

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

**Table Shows: Time Interval of Tooth Paste Usage**

**Table Shows: Time Interval of Plaque Collection**

| Sample Count                                      | Time Interval | Day Count |
|---------------------------------------------------|---------------|-----------|
| Sample No.1 (baseline without use of study dentifrices) | (T<sub>1</sub>) (Start of study) | Day : 1   |
| Sample No.2                                       | T<sub>2</sub>  | Day : 3   |
| Sample No.3                                       | T<sub>3</sub>  | 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.).
Distilled Water

Wire Loop

Micropipette

Sterilization of Diluted Agar Medium in Autoclave

Petridishes Placed Inside Incubator

Solidification of Agar Medium in Laminar Air Flow

Incubator

Spreading of Plaque Sample over Petridish
Cardiogenic. 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 Stainless steel 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.

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| 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 Wire loop          |
| 11   | Disposable Mouth mask         |

**RESULT**

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

| Days | Mean difference | T    | d.f. | P value |
|------|-----------------|------|------|---------|
| Day 1| -               | 0.16667 | 1.153 | 29  | 0.258* |
| Day 2| -               | 0.66667 | 3.808 | 29  | 0.001*** |

**CONCLUSION**

This shows Stainless steel bracket has statistically significant reduction of Streptococcus mutans with Fluoride toothpaste.
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