

Do Orthodontic Bracket Designs Affect *Streptococcus mutans* Count with Conventional Fluoridated Toothpastes?

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Abstract

Introduction: Metallic orthodontic brackets have been found to induce specific changes in the oral environment such as reduced levels of pH, increased plaque accumulation, and elevated *Streptococcus mutans* colonization. This study ascertained if design differences created differences in microbiological counts of the organism being investigated.

Materials and Methods: A total of 30 orthodontic patients were included in the study with stainless steel (SS) bracket bonded on tooth number 15 and self-ligating bracket (SLB) on tooth number 25. The patients were examined at the 1st visit as baseline record, after 24 h and then after 6 days for comparison. Pooled plaque samples were collected from the buccal surface of both teeth and sent for culture.

Results: SLB bracket when used with conventional fluoridated toothpastes showed more reduction of *S. mutans* (± 1.13333 with $P = 0.000$) as compared to SS bracket (± 0.66667 with $P = 0.001$), but no statistically significant difference ($P > 0.05$) was noted between both the brackets.

Conclusion: Conventional fluoridated toothpaste performed well and clinically efficient in reducing *S. mutans* colony counts around SS and SLB. This would be a useful innovation specially in patients who are periodontally compromised and those who have difficulty in maintaining oral hygiene during orthodontic treatment.

Key words: Fluoridated toothpaste, Self-ligating brackets, Stainless steel brackets

INTRODUCTION

Orthodontic patients are faced with the hazard of increased retention of food particles and plaque accumulation due to the presence of multiple attachments like brackets and other auxiliaries in the oral cavity forming catchment areas for plaque.¹ This results in oral ecological changes with

the low pH environment and increased proportions and an absolute number of salivary mutans. *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.² First, *S. mutans* is an anaerobic bacterium known to produce lactic acid as part of its metabolism. Second, there is the ability of *S. 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. The most important virulence factor is the acidophilicity of *S. mutans*. Unlike the majority of oral microorganisms, *S. mutans* thrives under acidic conditions and becomes the dominant bacterium in cultures with permanently reduced pH. Although brushing teeth twice a day is considered

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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.³⁻⁹

Aim and Objective

To ascertain if conventional fluoridated dentifrices and different bracket design combination could be effective in reducing *S. mutans* count in patients undergoing orthodontic treatment.

MATERIALS AND METHODS

Randomized, prospective, cross-sectional, single-blinded, microbiological assay study with each patient acting his/her own control in this study. Department of Orthodontics and Dentofacial Orthopedics, Divya Jyoti College of Dental Sciences and Research and Microbiological Assay were conducted in Divya Jyoti Hospital, Uttar Pradesh, India.

This study was approved by Institutional Committee (IEC No DJD/IEC/2014/A-001). A written consent was taken from each participating subject. 30 orthodontic patients were included in the study with stainless steel (SS) bracket bonded on tooth number 15 and self-ligating bracket (SLB) on tooth number 25. The patients were examined at the 1st visit as baseline record, after 24 h and then after 6 days for comparison. Pooled plaque samples were collected from the buccal surface of both teeth and sent for culture.

RESULTS

SLB, when used with conventional fluoridated toothpastes, showed more reduction of *S. mutans* (± 1.13333 with $P = 0.000$) as compared to SS bracket (± 0.66667 with $P = 0.001$), but no statistically significant difference ($P > 0.05$) was noted between both the brackets (Table 1 and Figure 1).

DISCUSSION

Plaque is composed of various microorganisms of which *S. mutans* is the most cariogenic. Loesche *et al.*¹⁰ showed a significant association between plaque levels of *S. mutans* and caries. Although white spot lesion (WSL) occurs in caries development irrespective of orthodontic treatment, it is during orthodontic treatment that they are extremely common and of prime concern for the clinician. The brackets, bands, arch wires and elastomeric modules of fixed orthodontic appliances provide additional surface area for bacteria to develop and thus accelerate the accumulation of plaque and the formation of lesions in areas that would normally have a low risk of caries.

Table 1: Comparison of means of *Streptococcus mutans* count between two days in stainless steel bracket and self ligating bracket by paired t-test

Days	Mean difference	T	d.f	P value
SS				
Base line - after 24 h	0.16667	1.153	29	0.258
Day 1-8	0.66667	3.808	29	0.001
SLB				
Base line - after 24 h	0.00000	0.000	29	1.000
Day 1-8	1.13333	9.109	29	0.000

SLB: Self-ligating bracket, SS: Stainless steel

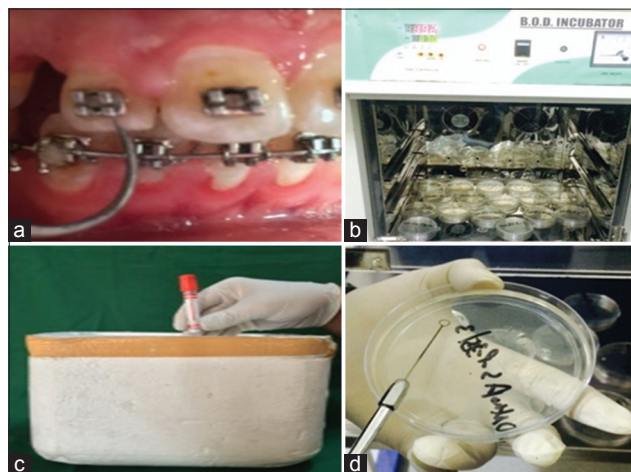


Figure 1: (a) Four pass method of plaque collection. (b) Four pass method of plaque collection. (c) Ice box. (d) Spreading of plaque sample over petridish

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 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.⁴⁻⁶

This study was unique in design as each patient acted as his/her own control as each quadrant of the mouth had a different bracket bonded on a designated tooth. SS bracket was bonded on tooth number 12, SLB on tooth number 25. The results of this study were in accordance to the study conducted by Pellegrini *et al.*¹¹ and found that self-ligating attachments had fewer bacteria in plaque than teeth bonded with different brackets. This was also in consonance to the study conducted by Fadia *et al.*¹⁰ who found reduced bacterial colonization and better plaque control with SL orthodontic bracket appliance system as

compared to conventional ligation method. The results of this study were also in consonance to the study conducted by Pandis *et al.*¹² to investigate the effect conventional and SLB on the levels of *S. mutans*. Statistical analysis showed no difference with respect to *S. mutans* counts between the two bracket groups.

CONCLUSION

- Conventional fluoridated toothpaste performed well and clinically efficient in reducing *S. mutans* colony counts around SS and SLB.
- This would be a useful innovation specially in patients who are periodontally compromised and those who have difficulty in maintaining oral hygiene during orthodontic treatment.

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