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***Staphylococcus aureus* count in salivary samples of patients treated with self-ligating prescriptions: A comparative clinical study**

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Abstract

Background: The microbiota of oral environment includes colonization of a complex microbiota, which changes drastically when an Orthodontic appliance is introduced in the oral cavity. These changes are attributable to the increased affinity of the bacteria to the irregular surfaces of Orthodontic appliances. These factors stress the need for microbial control during the course of treatment than usual. The aim of this study was to determine whether staph. aureus count in lingual or labial prescriptions.

Methodology: 20 healthy patients satisfying the criteria were recruited for the study.

Among these patients group I consisted of 10 patients being treated with Self-ligating Labial prescription and group II consisted of 10 patients being treated with Self-Ligating Lingual prescription. Salivary samples of all the 20 subjects were collected at various intervals. All the collected sample were cultured and the microbes were isolated and identified according to their cultural Characteristics and Biochemical reactions at T0 (starting of treatment), T1 (3 months after treatment) and T2 (6 months after initial treatment) intervals.

Conclusion: The count of staphylococcus aureus increased progressively during the treatment and was seen more in Self-Ligating Lingual orthodontic appliance than Self-ligating Labial orthodontic appliance.

Keywords: Self-Ligating brackets, Microbial count, Agar plates

Introduction

It is an established fact that orthodontic appliances change the quality and quantity of bacteria of the oral cavity. One change is excessive growth of putative periodontal pathogens around orthodontic appliances. Increased composition of periodontal pathogens induces gingival inflammation by the interactions between the pathogens and host tissues [1]. Self-ligating brackets have been a major focus of attention in Orthodontics in recent years, which explains the various designs developed by manufacturers of orthodontic material. All of them have very similar characteristics and can be divided into two groups: active and passive brackets [2].

In a study conducted by Pellegrini *et al.*, [3] with the objective of assessing accumulation of bacterial plaque in self-ligating and conventional brackets, the authors concluded that active self-ligating brackets are less likely to accumulate dental plaque when compared to conventional brackets.

Many studies have investigated bacterial adhesion to orthodontic brackets [4-7], suggesting that Mutans Streptococcus adhesion to orthodontic brackets varies according to bracket materials and types. A lot of studies have shown an increase in the absolute number and percentage of *Staphylococcus aureus* [8]. *Staphylococcus aureus* is a gram-positive, round-shaped bacterium that is a member of the Firmicutes and is frequent habitat in the nose, respiratory tract, and on the skin. It is often positive for catalase and nitrate reduction and is a facultative anaerobe that can grow without the need for oxygen. *Staphylococcus aureus* has become one of the community and nosocomial pathogens of epidemiological concern.

Keeping in view the above literature, the aim of the present study was to comparatively evaluate the *Staphylococcus aureus* in Salivary Samples of Patients when orthodontic treatment is performed with Self-Ligating Labial and Self-Ligating Lingual Orthodontic prescriptions.

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Materials and Methods

This study consisted of 20 subjects who were divided into two groups. The first group consisted of 10 patients who were treated with lingual Self-Ligating prescription and the second group consisted of patients treated with labial Self-Ligating prescriptions. The inclusion criteria included: Male and female patients of age group 15 to 20 yrs, orthodontic patients with no underlying oral and systemic disease. The exclusion criteria included: Smokers, Patients on antibiotics on or before a period of three months of initial examination.

The Non-stimulated salivary samples were collected (10 ml) in a sterile test tube and were sent to the laboratory for microbial analysis. Subjects were instructed not to eat or to drink for at least one hour before sample collection. Subjects were made to sit on a dental chair, slightly bent forward and the saliva was collected by having the subject spit into a sterile plastic graduated cup with 1-mL gradation marks. Salivary samples of all the 20 subjects were collected at T0 (at the starting of treatment), T1 (3 months after treatment) and T2 (6 months from the initial treatment)

All the collected sample were cultured aerobically on Mac conkey agar and Chocolate Agar. After 24-48 hours, the microbes were isolated and identified according to their cultural characteristics.

Statistical analysis

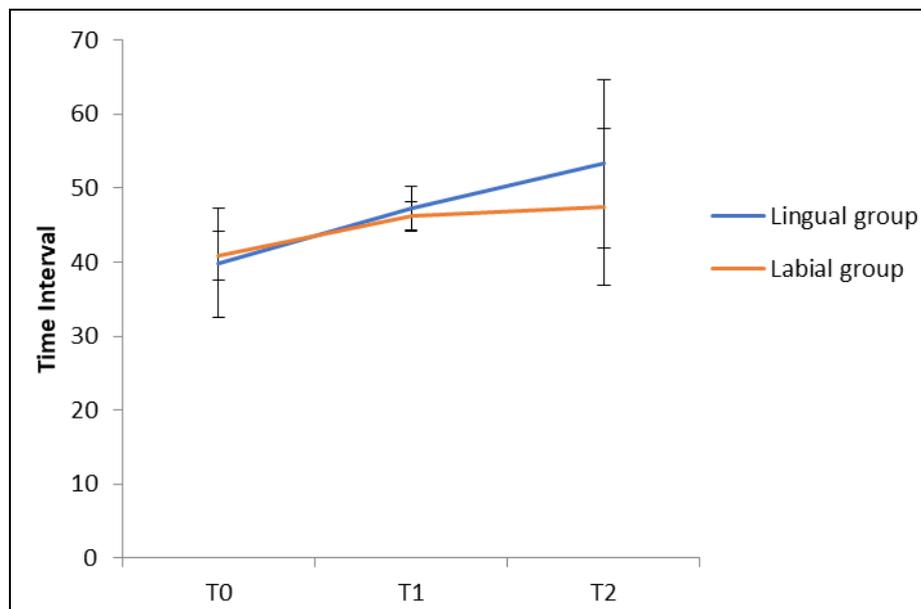
The data was analysed using SPSS software (version 26) and Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale within each group. Tables and graphs were generated using Microsoft Excel (2013).

Results

Statistical analysis showed increase in the staphylococcus counts in order $T_2 > T_1 > T_0$. As the treatment progressed the staphylococcus Aureus count increased.

Table 1: Difference between staphylococcus aureus counts between different time intervals T0, T1 and T2 in lingual and labial group using student t-test.

Time Interval	Lingual group	Labial group	Total	P value
T0	39.88±7.32	40.88±3.30	40.38±5.63	0.584
T1	47.30±2.93	46.19±2.00	46.75±2.54	0.168
T2	53.28±11.43	47.37±10.58	50.33±11.28	0.098+
P value				
T0 vs T1	<0.001**	<0.001**	<0.001**	-
T0 vs T2	<0.001**	0.004**	<0.001**	-
T1 vs T2	0.025*	0.645	0.051+	-



Graph 1: Increasing curve of the *Staphylococcus aureus* count in lingual as compared to labial group.

Discussion

The results of this study showed an increase in the staphylococcus aureus count as the treatment progressed with statistically significant results (table 1). The staphylococcus aureus count was clearly high in the lingual group as compared to labial group (graph 1). The higher bacterial adhesion to Self-Ligating lingual might be explained by the difference in bracket configuration, oral hygiene measures.

There is plenty of literature on increase and change in oral microbiota in lingual prescriptions. Stamm *et al.* [9] found that, during lingual orthodontic treatment, there is oral hygiene impairment. Artun [10] reported that visible plaque and gingivitis were present in up to 70% of the patients after starting the lingual treatment. Sinclair *et al.* [11] saw significantly elevated plaque accumulation in patients wearing lingual brackets. Other studies [12, 13] have also shown a greater risk of plaque accumulation and gingivitis in patients treated with lingual prescriptions.

A study conducted by Mummolo *et al.* [14] stated that various species of bacteria change over time during the orthodontic treatment, and seems to show different trends, depending on the type of orthodontic device and comparatively reduced count was seen in Self-Ligating. As more plaque accumulates, more bacteria can be available for detection. This may be due to the specific role of saliva in the bacterial adhesion and plaque accumulation. Salivary pellicles formed on the tooth surfaces significantly contribute to plaque accumulation by providing specific receptors for primary colonizers [15].

All above considerations, along with the different results found in the studies cited above and the growing trend towards the use of self-ligating brackets, seem to justify the present study which aims to comparatively evaluate the *Staphylococcus aureus* count in Salivary Samples of Patients being treated with Self-Ligating labial and lingual Orthodontic appliance. In the literature, there are numerous studies about the periodontal and microbial effects of labial

orthodontic treatment, but only limited research has been performed with respect to Self-Ligating lingual prescriptions. In the present study all the individuals were treated with self-ligating brackets, Self-Ligating labial brackets featured a low count of staph. aureus count in the salivary samples when compared with patients treated with Self-Ligating lingual brackets. These results suggest that the use of labial self-ligating brackets predisposes a reduction in dental plaque retention on the tooth surface.

Further studies are needed to reveal Information on the relationships between periodontal pathogens and self-ligating brackets. Such *in vivo* studies will be needed to elucidate the reason for the differences in bacterial adhesion to different brackets.

Conclusion

The study concluded

1. As the treatment progressed the count of staphylococcus aureus increased in both the lingual and labial groups.
2. Staphylococcus aureus count is seen more in lingual as compared to labial group as duration increased from T1 to T2.

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