



Special Review Article

ANALYZE THE MICROBIAL COUNT IN BETWEEN STAINLESS STEEL LIGATURE WIRE AND ELASTOMERIC MODULES LIGATION TECHNIQUES USED IN FIXED ORTHODONTIC MECHANOTHERAPY

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Introduction

Today, with an ever-growing prominence on aesthetics among the adults orthodontic treatment is fetching more and more admire^[1] due to its attempt to assemble esthetic, functional and dynamic demands. While to be completely successful, orthodontic treatment needs to ensure the integrity of dental and periodontal tissues and fixed orthodontic treatment is the favored and mainly the familiar method for treating malocclusion.^[2,3] The active components for orthodontic treatment comprise of arch wires, springs, elastics while passive components comprise of bands, brackets, buccal tubes and ligature wires^[4,5]. Orthodontic ligation techniques are used to secure the arch wire to the brackets and they comprise of stainless-steel ligatures wires, elastic modules and new system introduce that is self-ligation system.^[6] Earlier stainless-steel ligatures were used to secure the arch wires to the bracket slot as they are cheap, essentially free from deformation, degradation but due to food and other trapped debris oral hygiene maintenance is challenging.^[4,6,7] Whereas elastomeric ligature became accessible in the belatedly 1960s and remuneration was of condensed time; obligatory to lay but due to more of adsorption property, accumulation of biofilms and dental plaques, poorer oral hygiene, failure to fully engage an arch wire are the issues faced.^[8] To overcome these challenges, new self ligation system was introduced in 1990s that reduces the friction between arch wires and bracket slot with better torque control. From the patient's perspective also; the self ligating system are easy to clean facilitate due to wing less design.^[9,10]

Orthodontic treatment is always associated with microbial colonization of the dental and gingival tissues. It has been said that orthodontic appliances are always a trigger inside the oral cavity for qualitative and quantitative changes as they alter the bacterial growth through their physicochemical conditions. ^[11]Orthodontic appliances tend to enhance bacterial growth by providing a conducive environment. Even collection and retention of food debris which is popular contribution to bacterial growth can be done in the bracket design also as ligation technique or undercut areas provide additional surfaces for the same. ^[12]The insertion of orthodontic wires tends to create new surface available for plaque formation and therefore increase the level of microorganisms in the oral cavity. ^[13,14]Once ligation is established, additional factors may dictate further colonization. ^[15]The dental literature reports that orthodontic treatment induces changes in the oral environment through various means such as with enhanced figure of plaque retentive surfaces, supplementing the bacterial echelon of *Streptococcus mutans* and *Lactobacillus*. These appliances also modify the patient's salivary characteristics, that are, pH, buffer capacity, and salivary flow. ^[16]With the healthier idea of the current scenario oral health professionals and orthodontists can overlay the approach for better, enhanced and effectual defensive proposals while during the fixed orthodontic treatment. Hence, this study was conducted with an aim to analyze the microbial counts in between stainless steel ligature wire and elastomeric modules ligation techniques used in fixed orthodontic mechanotherapy.

Methodology

The study was conducted in Department of Orthodontic and Dentofacial Orthopaedics of Rajasthan Dental College&Hospital , Jaipur, Rajasthan to analyze the microbial counts in between stainless steel ligature wire and elastomeric modules ligation techniques used in fixed orthodontic mechanotherapy.

Sample selection: - Ninety orthodontic patients with age group 18-40years, who were undergoing fixed orthodontic mechanotherapy with 0.022" MBT; who agreed to be the part of the study were randomly selected after taking the informed consent. They were divided into 2 groups;

Group I those Patients who were undergoing the treatment through elastic modules for ligating the arch wire to bracket of the patients

Group II where Stain Less Steel ligature wire was used for ligating the arch wire to brackets of patients.

Collected samples were grouped under different time intervals such as

- a. 1st day (T0)
- b. 2nd day (T1)
- c. 30th day (T2)

Standard oral hygiene instructions were provided to all of the patients and samples of the modules were collected and checked for the existence or nonexistence of Streptococcus Mutans and Lactobacilli. For the microbial count, samples were vortexed for 10 sec. and a series of three 10-fold (10^{-3} dilution) of each sample were prepared. 10 mm of each dilution were seeded on to the MitisSalivarius and Rogosa SL agar plates for Streptococcus and Lactobacillus estimation respectively. Plates for the Streptococcus Mutans estimation were incubated in an incubator at 37°C with 5-10% CO_2 for 24-48 h. For Lactobacillus estimation, the plates were incubated at 37°C for 48-72 h at 5% CO_2 in the vacuum anaerobic jar. Plates were removed from jar, growth was noted and the numbers of colonies were counted with a colony counter. The data was expressed as number of colonies per sample and tabulated and sent for statistical analysis.

Statistical analysis:- The data was coded and entered into Microsoft Excel spreadsheet and analysis was done using SPSS version 20 where descriptive statistics included computation of means and standard deviations and Wilcoxon tests were used at 5% significance level.

Results

The present study was conducted for analyzing the microbial count while during fixed orthodontic mechanotherapy in both elastomeric modules and stainless steel ligature patients. The study revealed that there is presence of Streptococcus Mutans and Lactobacilli during orthodontic treatment at all the intervals of time during orthodontic treatment. With increased duration of time, there was progressive increase in the colonization of these microbes on the elastomeric modules.

Table 1: Intergroup comparison of Mean Count of Streptococcus Mutans among both of the groups at different time intervals

Time Interval	Group	No	Mean	Std. deviation	Mean diff	p value
T0	Elastomeric Module	45	40.17	17.889	0.400	0.05**
	Stainless Steel	45	40.57	12.811		
T1	Elastomeric Module	45	64.63	22.940	22.533	0.03*
	Stainless Steel	45	42.10	14.942		
T2	Elastomeric Module	45	37.83	17.511	20.73	0.000*

	Stainless Steel	45	17.10	12.095		
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*statistically significant**statistically non- significant

Table 2: Intergroup comparison of Mean Count of Lactobacillus among both of the groups at different time intervals

Time Interval	Group	No	Mean	Std. deviation	Mean diff	p value
T0	Elastomeric Module	45	54.93	30.144	22.933	0.07**
	Stainless Steel	45	32.00	8.554		
T1	Elastomeric Module	45	72.40	22.710	40.667	0.02*
	Stainless Steel	45	31.73	9.184		
T2	Elastomeric Module	45	57.03	39.937	44.733	0.001*
	Stainless Steel	45	12.30	8.264		

*statistically significant**statistically non- significant

Discussion

Fixed orthodontic treatment is the favored way of treating the malocclusion. The active components for orthodontic treatment include of arch wires, springs, elastics while passive components comprise of bands, brackets, buccal tubes and ligature wires.^[17] Orthodontic ligation techniques are used to secure the arch wire to the brackets and they comprise of stainless-steel ligatures wires, elastic modules and new system introduce that is self-ligation system.^[18]

This contemporary study was conducted for analyzing microbial load during fixed orthodontic mechanotherapy among 90 studied patients with age of 18-40 years. The patients were treated using elastomeric modules and stainless steel ligature rings with both the groups were advised to maintain the oral hygiene and subsequently they were tested for streptococcus and lactobacillus strains. This study evaluated the adherence of two microorganisms to the elastomeric ligatures namely Streptococcus Mutans and Lactobacillus and revealed the non significant results at baseline (T0) for streptococcus for both the orthodontic therapy were seen ($p < .05$) . At 2nd

day(T1) as well as on 30th day (T2) the differences were significant ($p < .05$) for stainless steel wires. The results at baseline (T0) for lactobacillus for both the orthodontic therapy were seen as non significant ($p < .05$). At 2nd days (T1) as well as on 30th day (T2) the differences were found to be significant ($p < .05$) for stainless steel wires.

The study by Caccianiga P et al also resonate similar findings where it is confirmed the risk of budding unfavorable micro biota among patients treated with multibrackets as compared to those treated with clear aligners. Even Mavami M et al have also done the examination of elastomeric modules over a scheduled period of time and witness the growth of Streptococcus Mutans and lactobacillus during fixed mechanotherapy.^[19,20,21]

There was momentous existence of microbial colonisation of Streptococcus Mutans and Lactobacillus on the elastomeric modules during orthodontic treatment at different intervals of time and statistically significant rise was seen in the microbial colonization of Streptococcus Mutans & Lactobacilli during the orthodontic treatment. It is recommended in this study that the patients who are ligated with elastomeric modules be supposed to exercise utmost on oral hygiene with adjunctive aids along with their routine brushing. Even the orthodontist should take suitable dealings to steer clear of any iatrogenic damage and alteration of the oral environment.

Conclusion

This study appraised the observance of two microorganisms i.e. Streptococcus Mutans and Lactobacillus while during the fixed orthodontic therapy and even progressive augment in the colonization at different intervals of time. In view of the fact that these organisms grounds the initiation and progression of caries or alteration in periodontium, thus patients undergoing fixed orthodontic treatment and ligated with elastomeric modules should implement utmost oral hygiene in order to avoid any amendment of the oral environment and subsequent iatrogenic damage.

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