Journal of Chemical Health Risks

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JCHR (2024) 14(6), 2797-2802 | ISSN:2251-6727

Comprehensive Evaluation of Frictional Resistance between Orthodontic Bracket and Archwire Noted after Different Mouthwash Usages: An in Vitro (Original Research) Study

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(Received: 16 September 2024 Revised: 11 October 2024 Accepted: 11 December 2024)

KEYWORDS

chewable gummies, cissus quadrangularis, gelatin

ABSTRACT:

Aim: The solitary aim of this study was to assess the frictional resistance between orthodontic bracket and archwire after exposed to two different commercially available mouthwashes i.e. Clove Ultimate Mouthwash and Amflor Mouthwash.

Materials & Methods: In this study, total 30 extracted maxillary first molars were studied which were taken from the individuals of age group of 25-45 years. Simple random sampling procedure was utilized. All selected teeth were kept in normal saline before starting of the study. Stainless steel orthodontic arch wire was ligated over the stainless steel brackets. Stainless steel orthodontic arch wire was taken for each sample fixture. First study group was control in which samples were absorbed into artificial saliva therefore Group one was known as control group. Group two and group three samples were kept into Clove Ultimate Mouthwash and Amflor Mouthwash respectively. Standard and typical static frictional resistance was considered by using universal testing machine.

Statistical Analysis and Results: Statistical analysis was completed by Statistical software Statistical Package for the Social Sciences version 22. Group III samples showed maximum Mean Frictional Resistance (1.76N) however, group II and group I samples showed considerably smaller values of Mean Frictional Resistance (graph 1). Level of Significance (p value) was reported to be significant for the samples of group II (Clove Ultimate Mouthwash). Standard deviation was noted to be maximum in the samples of group III (Amflor Mouthwash). It was 0.934 in group III however; standard error was minimum in this group (0.036). The level of significance was found to be highly significant for the ANOVA test between the groups (0.001).

Conclusion: Within the limitation of the study authors stated that Clove Ultimate Mouthwash has lesser static frictional resistance compared to Amflor Mouthwashes. Therefore in the risky clinical conditions, Clove Ultimate Mouthwash must be competently used for achieving optimal healthy environment. Nonetheless, we predict other large scale future studies to produce applicable and real guidelines in these regards.

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Introduction

Mouth washes are having integral role in marinating oral health and minimizing the microbial flora of mouth. Several mouthwashes are available in the market these days with different specifications and advantages.[1-5] However, most of these mouth washes are working on similar concepts like: the offer superior Cavity Protection since they have sodium fluoride as a key ingredient. Most of the mouthwashes including Clove Ultimate works equal as the best toothpaste with fluoride for preventing cavities. Literature has well evidenced several studies regarding these aspects.[6-9] Many of the researchers are still in exploration of best possible mouthwashes which can offer maximum gingival health with minimum damage to adjoining structures. Mouthwashes also offer plaque and Stain Reduction by stopping unpleasant buildup and discoloration.[10-15] Clove Ultimate also assists diminish plaque and stains, revealing a brighter smile. Mouthwashes also help in Teeth Whitening with normal use. Mouthwashes also help in Gum Health since it is an essential aspect of overall oral health. Mouthwashes also maintain fresh Breath Control by their Zinc salt and special flavoring process they help control bad breath, ensuring long-lasting freshness. Most of the mouthwashes existing these days are free from dangerous constituents like parabens, peroxide, and triclosan. Typically they are mild efficient by the further addition of pyrophosphate which augments its anticavity and stain-removing properties.[16-19] Consequently; this study was designed and performed to evaluate the frictional resistance between orthodontic bracket and archwire after exposed to two different commercially available mouthwashes i.e. Clove Ultimate Mouthwash and Amflor Mouthwash.

Materials & Methods

In-vitro methodology was finalized for smooth conduction of the study. For sampling purpose total 30 extracted maxillary first molars was collected and studied in detail in the study. Records were comprehensively considered while selection of the sample molar teeth. Sample teeth extracted only from the age group of 25-45 were included in the study. Simple random sampling procedure was utilized in the study to maintain transparency and data quality. Other inclusion criteria were; sample teeth from male and female subjects, sample teeth with apparently intact tooth structure without any rot resorption. All sample teeth were segregated and assorted from the department of Oral Surgery whereas the study was performed in the department of Orthodontics of the institute. Exclusion criteria of sample teeth included: teeth with caries, teeth with wasting diseases. Teeth with any kind of staining (intrinsic/extrinsic) fracture were also excluded. All selected teeth were kept in normal saline before starting of the study. For smooth conduction of the study, samples were grouped into three groups of ten each. All samples were mounted on self cure acrylic resin block of rectangle shape to give stability and strength to individual sample fixture during trying process. The dimensions of acrylic blocks were standard for all samples. All sample teeth were cleaned methodically with pumic. The orthodontic brackets were fixed and cemented at the centre of the clinical crown with etching with 37% phosphoric acid for 30 seconds. Stainless steel orthodontic arch wire was ligated over the stainless steel brackets. A characteristic length of 3.5 cm of stainless steel orthodontic arch wire was taken for each sample fixture. First study group was control in which samples were absorbed into artificial saliva therefore Group one was known as control group. Group two and group three samples were kept into Clove Ultimate Mouthwash and Amflor Mouthwash respectively. All teeth were immersed in their particular solutions for flat 80 minutes. Standard and typical static frictional resistance was considered by using universal testing machine (Instron Model 5699, Hindustan Heavy Industries Pvt Ltd, India). The wire was attempted to detach at a crosshead speed of 0.5 mm/min. Data consequently received was set and entered in table and subjected to basic statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

Statistical Analysis and Results

Here all relevant significant findings and observations were sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 22 (UMC Inc., Arizona, USA). The finalized data was subjected to suitable statistical tests to obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI. Table 1 shows sample assortment and segregation into groups. Group I, II and III have artificial saliva, Clove Ultimate Mouthwash and Amflor Mouthwashes correspondingly. All three groups have 10 samples each for their further

Journal of Chemical Health Risks

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JCHR (2024) 14(6), 2797-2802 | ISSN:2251-6727

investigations and analysis. Table 2 exhibits basic statistical representation with level of significance assessment using Pearson chi-square test [for group I, II, III]. Group III samples showed maximum Mean Frictional Resistance (1.76N) however, group II and group I samples showed considerably smaller values of Mean Frictional Resistance (graph 1). Level of Significance (p value) was reported to be significant for the samples of group II (Clove Ultimate Mouthwash). Standard deviation was noted to be maximum in the samples of group III (Amflor Mouthwash). It was 0.934 in group III however; standard error was minimum in this group (0.036). Table 3 demonstrates assessment of frictional resistance among the three study groups using one-way ANOVA [for group I, II, III]. The level of significance was found to be highly significant for the ANOVA test between the groups (0.001). In ANOVA assessment the values for Between Groups were highly imperative. Graph 2 represented about the 95% CI & PCS and df.

Table 1: Sample Distribution and Study Groups

Group	n	Mouthwash
I	10	Artificial Saliva (Control)
II	10	Clove Ultimate Mouthwash
III	10	Amflor Mouthwash

Table 2: Basic Statistical Depiction with Level of Significance assessment using Pearson Chi-Square Test [for Group I, II, III]

Parameters	Mean Frictional Resistance (Newton)	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Group I	1.01	0.783	0.138	1.16	1.923	1.0	0.07
Group II	1.24	0.643	0.928	1.29	1.512	2.0	0.02*
Group III	1.76	0.934	0.036	1.23	1.620	1.0	0.08
***p<0.05 significant**							

Table 3: Comparison of Frictional Resistance among the 3 Study Groups Using One-Way ANOVA [For Group I, II, III]

Parameters	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Significance (p value)
Between Groups	4	5.234	1.232	3.655	0.001*
Within Groups	39	17.899	0.112	-	
Cumulative	556.12	21.543	-		
***p<0.05 significant**					

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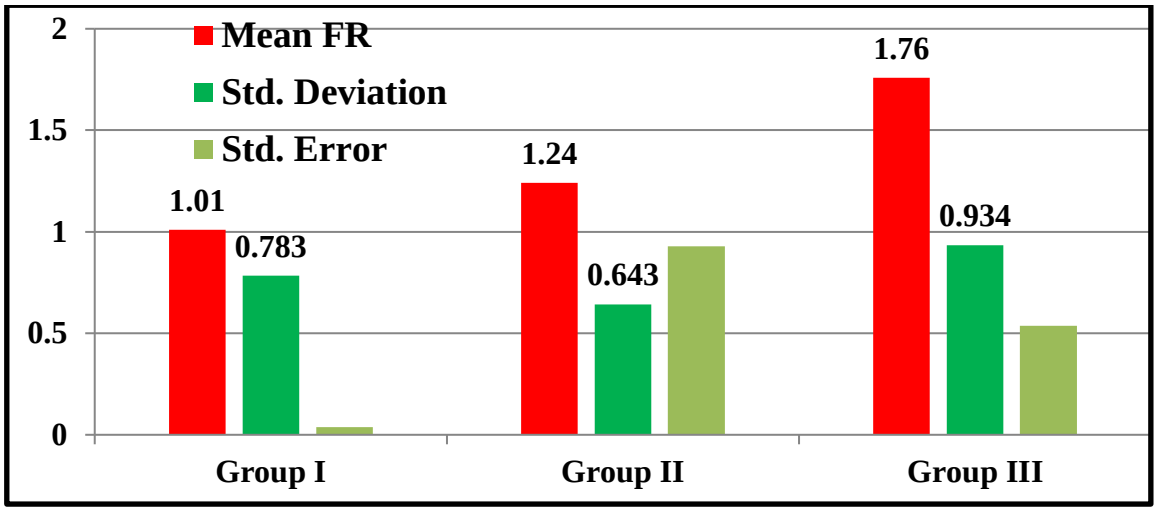
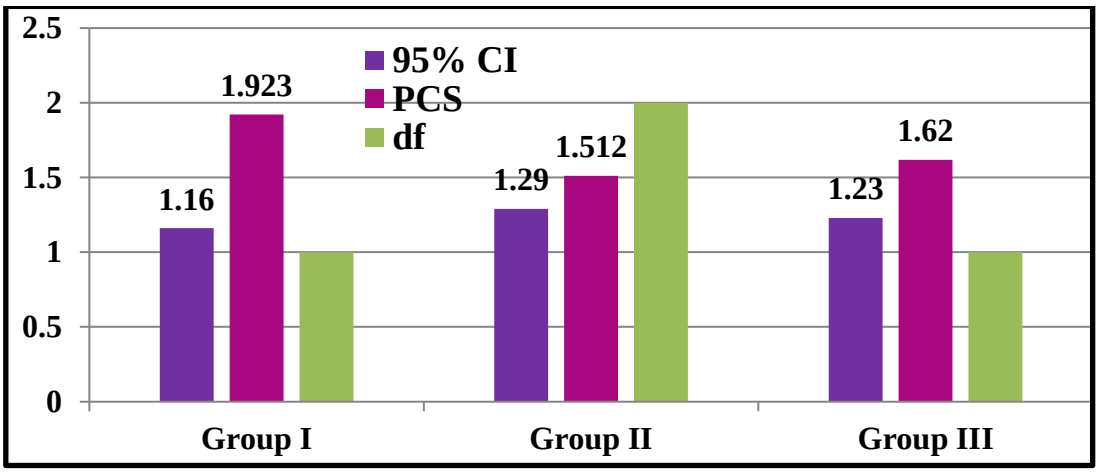
Graph 1: Mean Frictional Resistance (Fr in Newton) & Std. Deviation Std. Error



Graph 2: 95% CI & PCS and df



Discussion

Tecco and other coworkers have experimented extensively about the influence of self-ligating brackets, low friction ligatures, and archwire on frictional resistance. They were also agreed on the imperative and critical role of frictional resistance on archwire. Their inferences were having clinical applicability and significance.[20] Chimenti and other colleagues had researched about the Friction of orthodontic elastomeric ligatures with different dimensions. They also concluded that frictional resistance on archwire plays a key role in the long term success of any orthodontic treatments and rehabilitations.[21] Ogata and other clinicians and workers have studied an experimented about the Frictional resistances in stainless steel bracket-wire combinations with effects of vertical deflections. Their results were in agreement with our results and recommodations.[22] Rossouw and other researchers have performed a detailed and comprehensive study to review the variables associated with low velocity frictional dynamic. Their inferences were highly significant and valuable.[23] Kusy and other pioneer researchers have experimented about the Effect of salivary viscosity on frictional coefficients of orthodontic archwire/bracket couples. It was their conclusion the there is clear effect of external environment like saliva or mouthwashes on frictional

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resistance between orthodontic bracket and archwire.[24] Henao and other investigators have studied about the frictional resistance of conventional and self-ligating bracket designs using standardized archwires and dental typodonts. They also agreed on the fact that mouthwashes do have effects on frictional resistance between orthodontic bracket and archwire.[25] Pillai and other researchers have conducted a study to compare of the frictional resistance between archwire and different bracket system.[26] Similarly, Ranjan Padhi and other colleagues have also experimented about the Evaluation of Frictional Resistance of Various Lingual Brackets With Nitinol.[27] Literature has well evidenced about the other similar pioneer studied those attempted to explore these similar effects.[28,29]

Conclusion

Within the limitation of the study authors have presented highly significant results and clinically applicable recommendations. They stated that Clove Ultimate Mouthwash has lesser static frictional resistance compared to Amflor Mouthwashes. Consequently in the susceptible clinical conditions, Clove Ultimate Mouthwash must be skillfully used for maximizing most favorable healthy environment in ongoing and indicated orthodontic situations. Our study inferences should be considered as indicative for guessing prognosis for similar clinical conditions. However, we anticipate other large scale future studies to generate relevant and concrete guidelines in these perspectives.

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