Original Article

Microbial Evaluation of the Effectiveness of Different Methods for Cleansing the Hawley's Retainer

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Abstract

Background: Retention is important to prevent relapse and holding of the teeth following orthodontic treatment in the treated position for the period of time necessary for the maintenance of the result. Hawley's retainer is most commonly used retainer for both arches. So with an aim microbial evaluation and their effectiveness of different methods for cleansing the Hawley's retainer as well as we have compared different methods for cleansing. **Materials and Methods:** A total of 40 patients who were undergone orthodontic treatment were randomly selected for the study in four groups of ten each. The sample of the saliva of the patient was collected to measure the value of salivary pH by pH Test for different time interval. **Results:** Result were tabulated and statistically formulated as per standard protocol. We observed that the microorganisms, that is, the *Streptococcus mutans* and *Lactobacillus* increased in all four groups from T0 to T3. The adherence of both the microorganisms, that is, the *S. mutans* and *Lactobacillus* was maximum with Group 1, that is, brushing with fluoride toothpaste followed by Group 2, that is, immersion of Hawley's retainer in a chlorhexidine solution, and least in Group 3, that is, (Using cleansing tablets). In our study, *Lactobacillus* colony-forming units count was found highest in Group 1 (Brushing with a fluoride toothpaste) followed by Group 2 (Immersion of Hawley's retainer in a chlorhexidine solution). It was 232.60 ± 142.40 in Group 1 151.00 ± 136.98 in Group 2, respectively, at T0. With time, it was continuously increasing in both the groups. It increases to 653.80 ± 85.66 in Group 1 and 566.90 ± 206.01 in Group 2, respectively, at T3. **Conclusion:** The present study indicates that cleansing tablets are the best method to clean Hawley's retainer and aids in least retention of oral microflora compared with the other two methods. The oral microflora count was found to increase from T0 to T3 in all four groups. However, the increase was maximum with the control group followed by the brushing method, chlorhexidine solution, and the least in cleansing tablets.

Keywords: Hawley's retainer, Microbial evaluation, Cleansing tablets, Chlorhexidine, Tooth paste.

Introduction

After completion of orthodontic treatment and the removal of orthodontic appliances, there is a tendency for teeth to move from their corrected positions towards their original position and for the irregularity of the teeth to increase again.[1]

If these tooth movements occur relatively quickly following orthodontic treatment, they are known as relapse. Relapse, as defined by the British Standards Institute is the "*return, following correction, of the features of the original malocclusion*"[2] evidence shows that significant deterioration of the corrected malocclusion and incisor alignment can occur within 4 weeks following the removal of fixed appliances when no retainers are used.[3]

In the longer term, evidence shows that the stability of lower incisor alignment is variable and unpredictable: A follow-up of 31 cases, 10 years after orthodontic treatment, found that less than 30% maintained satisfactory alignment while at 20 years post-treatment only 10% had an acceptable alignment.[4-6]

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Occlusal forces also play a role in the stability of the corrected malocclusion.[7] Achievement of Roth's functional occlusal goals will reduce the possibility that unwanted interferences or displacing occlusal contacts will cause changes in tooth position.[8,9]

Retention involves the use of appliances with or without adjunctive techniques to prevent any changes in tooth position in a sagittal, transverse, vertical, or rotational direction.[10,11] This has been shown to reduce rotational relapse by 30%.[12-14]

Removable appliances include the Hawley retainer, Begg retainer, Barrer retainer, and thermoplastic or vacuum-formed

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retainers. Removable retainers are advantageous in that they can be removed for oral hygiene procedures but in contrast, they can affect the patient's speech.[15-20] Ultimately the effectiveness of the retainer depends on individual patient compliance with the prescribed wear regime.[20]

The Hawley retainer, one of the most commonly used retainers, was originally fabricated from gold wire and vulcanized rubber ("vulcanite").[21] This improves retention of the appliance in the mouth and also gives better rotational control of the incisors.[22] In cases where first premolars have been extracted the labial bow can be soldered to the cribs on the first permanent molars so as not to cause the extraction space to re-open.[22] With an aim of present study is microbial evaluation of the effectiveness of different methods for cleansing the Hawley's retainer as well as to compare different methods for cleansing of Hawley's retainer.

Materials and Methods

A total of 40 patients who were undergone orthodontic treatment in the Department of Orthodontics and Dentofacial Orthopaedics at Peoples College of Dental Sciences and Research Centre, Bhanpur, Bhopal, M.P, were randomly selected for the study in four groups of ten each. The age group selection for the study will be 14–25 years. The oral hygiene instructions were given to the patients and data were collected 1 week after the oral prophylaxis. The sample of the saliva of the patient was collected to measure the value of salivary pH by pH Test. The patient was asked to spit into the sterile pipette. The pH test strips are placed into the pipette containing the saliva of the patient and the color change was noted. This reading was marked as T0. The normal instructions of oral hygiene were given to the patients and were recalled after 1 month; the plaque sample and salivary pH value were taken again as described earlier. Evaluation of *S. mutans* and *Lactobacillus* colonies, pH was done and reading was noted as T1. The same procedure was repeated after the completion of the 3rd month and 6-month isolation will be done of *S. mutans* and *Lactobacillus* colonies, the salivary pH values were measured and the readings were noted as T2 and T3, respectively. The comparative analysis of colony-forming units (CFU) of *S. mutans* and *Lactobacillus* value of salivary pH will be carried out before and after placing the appliance.

Results

Graph 1 reveals comparative evaluation of *Streptococcus* Spp. CFU Count between four different ligation techniques at T0, T1, T2, and T3. Streptococcus colony-forming unit was found highest in Group I (Brushing with fluoride tooth paste), followed by Group II and it was minimum in Group III. It was 346.00 ± 288.37 in Group I, 156.00 ± 142.77 in Group II and 41.10 ± 12.20 in (cleansing tablets), respectively, at T0. With the time it was continuously increasing in all four groups. It increases to775.00 ± 76.23 in Group I, 631.60 ± 221.50 in Group II and 225.10 ± 29.40 in (cleansing tablets), respectively, at T3. There was statistically highly significant difference found in *S. mutans* CFU between four groups at T0, T1, T2, and T3.

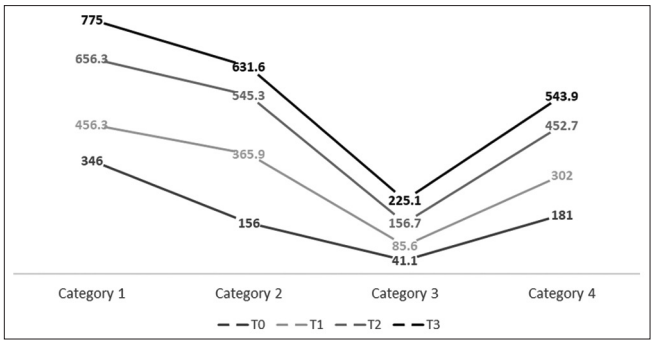
Graph 2 reveals comparative evaluation of *Lactobacillus* Spp. CFU Count between four groups at T0, T1, T2, and T3. *Lactobacillus* Spp. CFU Count was found highest in Group I (Brushing with fluoride tooth paste), followed by Group II and it was minimum in Group III. It was 232.60 ± 142.40 in Group I, 151.00 ± 136.98 and 33.80 ± 10.08 in cleansing tablets, respectively, at T0. With the time it was continuously increasing in all four groups. It increases to 653.80 ± 85.66 in Group I, 566.90 ± 206.01 in Group II, and 253.20 ± 47.95 in (cleansing tablets), respectively, at T3. There was statistically highly significant difference found in *Lactobacillus* Spp. CFU between four groups at T1, T2, and T3.

In our study, it was found that the microorganisms, that is, the *S. mutans* and *Lactobacillus* increased in all four groups from T0 to T3. The adherence of both the microorganisms, that is, the *S. mutans* and *Lactobacillus* was maximum with Group 1, that is, Brushing with fluoride toothpaste followed by Group 2, that is, Immersion of Hawley's retainer in a Chlorhexidine solution, and least in Group 3, that is, (Using cleansing tablets). In our study, *Lactobacillus* CFU count was found highest in Group 1 (Brushing with a fluoride toothpaste), followed by Group 2 (Immersion of Hawley's retainer in a chlorhexidine solution). It was 232.60 ± 142.40 in Group 1. 151.00 ± 136.98 in Group 2, respectively, at T0. With time, it was continuously increasing in both the groups. It increases to 653.80 ± 85.66 in Group 1 and 566.90 ± 206.01 in Group 2, respectively, at T3.

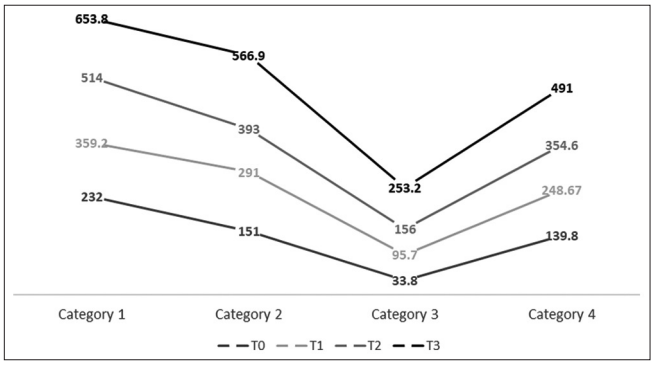
Discussion

This study shows the changes in clinical, salivary, and bacterial markers that occur in the oral environment at the beginning of orthodontic treatment with fixed appliances on the permanent dentition. The following markers emerged as protective factors: Patients without active caries injuries increased significantly stimulated salivary flow, buffer capacity, and salivary pH, after placement orthodontic appliances. In contrast, the following markers were negative risk factors to the oral environment: Slightly increase in the infection levels of SM and *Lactobacillus*, and of occult blood in saliva.

There was a statistically highly significant difference found in *Lactobacillus* CFU between two groups at T1, T2, and T3. *Streptococcus* CFU was found highest in Group 1 (Brushing with a fluoride toothpaste), followed by Group 2 (Immersion of Hawley's retainer in a chlorhexidine solution). With time *S. mutants* CFU was continuously increasing in both groups. It increases to 775.00 ± 76.23 in Group 1, 631.60 ± 221.50 in Group 2, respectively, at T3. There was a statistically highly significant difference found in *S. mutans* CFU between the two groups at T0, T1, T2, and T3. There was a statistically significant increment seen in *S. mutans* CFU from T0 to T3. Similarly, Chang *et al*. (1999)[22] conducted a study on the effect of orthodontic treatment on salivary flow, pH, buffer capacity, and levels of mutans streptococci and



Graph 1: Comparative evaluation of streptococcus Spp.CFU count between different groups at T0,T1,T2 and T3



Graph 2: Comparative evaluation of Lactobacillus Spp.CFU count between groups at T0,T1,T2, and T3

lactobacilli. There was a statistically significant increase in stimulated salivary flow rate, pH, buffer capacity, plaque index scores, and in the levels of MS and lactobacilli after 3 months of active treatment. The saliva buffering capacity, defined as salivary resistance to pH changes, is assigned to carbonate-bicarbonate systems, phosphates, and proteins. The bicarbonate system is responsible for about 85% of the buffering capacity in the pH range of 7.2–6.8. When the salivary flow rate increases, the concentration of bicarbonate ions also increases. In our study, a comparative evaluation of salivary pH between four different methods was done at T0, T1, T2, and T3. Salivary pH was slightly seen less in Groups I and II as compared to Group III at T1. It was normal at T0 and then salivary pH was continuously decreasing with the time among all four groups.

Conclusion

The present study indicates that cleansing tablets are the best method to clean orthodontic appliances and aids in least retention of oral microflora compared with the other two methods. The oral microflora count was found to increase from T0 to T3 in all four groups. However, the increase was maximum with the control group, followed by the brushing method, chlorhexidine solution, and the least in cleansing tablets. In this study, we found that the *S. mutans* and *Lactobacillus* count was found to increase significantly from T0 to T3 in all four groups. The *S. mutans* and *Lactobacillus* CFU count was found highest in Group 4 (control group), followed by group 1(brushing method) and it was minimum in Group 3 (cleansing tablet).

Limitations

There are many aspects of this study that could be improved. First, the other newer methods should be used. Second, the study tested the susceptibility of individual species as opposed to biofilms. Biofilms in the oral cavity are typically made up of multiple species and organic compounds. The microbiota makeup can vary based on the environment present in the oral cavity. Besides, the way a chemical affects bacteria can differ based on the components of the biofilm. Finally, the current study was based on an *in vitro* model as opposed to a clinical *in vivo* model.

Conflicts of Interest

The authors declare that they have no potential conflict of interests regarding this article.

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