EFFECT OF FIXED ORTHODONTIC APPLIANCES ON THE SALIVARY pH

Abstract

Objective: To assess the influence of fixed orthodontic appliances on the salivary pH.

Study design: A randomized controlled trial.

Place and duration of study: Department of Orthodontics, Armed Forces Institute of Dentistry in collaboration with the Department of Microbiology, Armed Forces Institute of Pathology Rawalpindi, from 10th September 2007 to 06th November 2008.

Patients and Methods: Sixty Subjects (11 males and 49 females) with age ranging 13-20 years were randomly selected and divided into a control and an experimental group of 30 each. Study involved analysis of salivary samples. A proforma indicating salivary levels of pH at T1 (pre treatment) and at T2 (after 4 months) with the differences between T1 and T2 was prepared for each subject.

Results: In experimental group salivary pH depicted a statistically significant decrease between T1 and T2. These changes in control group were insignificant.

Conclusions: Fixed orthodontic appliances (FOAs) tend to influence oral environment by lowering salivary pH towards acidic side.

Table: pH of saliva in both groups.

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
<th>p-value</th>
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<tr>
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<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
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<td>0.26</td>
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<td>0.35</td>
<td>7.21</td>
<td>0.27</td>
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<td>p-Value</td>
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<td>0.170</td>
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</tbody>
</table>

Discussion

Orthodontic treatment is now in great demand for preadolescent and adult patients in our society. Coupled with the fact that more patients are now seeking orthodontic treatment as comprehensive or adjunctive treatment to other dental specialties. The area of impact of these fixed orthodontic appliances is still not fully explored and the current study was designed to evaluate the effects of fixed orthodontic appliances on the salivary pH and further to find out any association of salivary pH on the formation of dental caries so that proper prophylactic measures are to be adopted to control it in future.
Fixed orthodontic appliances while providing additional surfaces that harbor microbial colonies and plaque further increase the risk for caries, gingivitis, and periodontal disease. If unchecked, poor oral hygiene may jeopardize orthodontic treatment outcomes. It is estimated that between 5-10% of orthodontic patients are unable to complete orthodontic treatment just for these reasons.

The saliva contributes to maintenance of the pH by two mechanisms. First, the flow of saliva eliminates carbohydrates that could be metabolized by bacteria and removes acids produced by bacteria. Second, acidity from drinks and foods, as well as from bacterial activity, is neutralized by the buffering activity of saliva. Bicarbonate is the major salivary buffering system of saliva, but peptides, proteins, and phosphates are also involved. Increases in pH also result from bacteria that metabolize salivine and urea into ammonia. Acids that are produced by the microbial metabolism of carbohydrates may accumulate in dental plaque because of the slow diffusion of saliva through dental plaque. Following sugar intake, the pH of dental plaque may decrease to below 5.0. The pH is an important parameter in oral microbial ecology.

An evaluation of salivary pH between orthodontic and non-orthodontic patients, in relation to the oral hygiene condition, that evaluated 4 groups of 10 patients each, (group 1: orthodontic patients having poor oral hygiene. group 2: orthodontic patients having good oral hygiene. group 3: non-orthodontic patients having poor oral hygiene. Group 4: non-orthodontic patients having good oral hygiene) found a mean pH approximately 7.4. The findings of this study suggest that orthodontic appliances have no influence on the salivary pH. While our study evaluating and comparing orthodontic patients and non-orthodontic controls found significant changes in pH of orthodontic patients towards acidic side, which is a symbol of an environment conducive for enamel demineralization.

Enamel demineralization has been demonstrated around orthodontic brackets after only one month of the treatment. In addition, estimates of white spot lesions in the orthodontically treated population range from 12.6% to 50% of patients. In addition, metallic brackets were found to induce specific changes in the oral environment such as decreased pH. This indicates that orthodontic brackets could be a potential risk for enamel demineralization. Findings which confer with the results of our study in local population. With an objective to determine means for preventing enamel demineralization through the knowledge about the adhesion of cariogenic streptococci to orthodontic brackets, a Korean study explored the adhesion levels of 4 cariogenic streptococci strains to various orthodontic brackets with respect to bracket type, bacterial strain, and incubation time. Five bracket types (monocrystalline sapphire, polycrystalline alumina, stainless steel, plastic, and titanium) were incubated with un-stimulated whole saliva followed by binding assays. Each cariogenic streptococci strain showed a characteristic adhesion pattern, and the adhesion amounts were highest in the plastic brackets and lowest in the monocrystalline sapphire brackets.

Curent study however used standardized fixed orthodontic appliances and elastomeric rings in all subjects of both groups, and was chiefly focused on the evaluation of changes in saliva of the subjects.

CONCLUSION

Fixed orthodontic appliances (FOAs) tend to influence oral environment by lowering salivary pH towards acidic side. Various retentive sites being provided by the fixed appliances are the optimal sites for harboring an array of microorganism, which in turn jeopardize the integrity of soft and hard tissue structures of the oral cavity.

Reference