

## ORIGINAL RESEARCH

### Evaluation of effect of orthodontic fixed appliances on salivary flow and viscosity-A clinical study

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#### ABSTRACT:

**Background:** Fixed orthodontic appliances can affect the oral hygiene by influencing several parameters including the saliva properties and microbial count. The present study was conducted to assess effect of orthodontic fixed appliances on salivary flow and viscosity. **Materials & Methods:** The present study was conducted on 56 patients of both genders undergoing fixed orthodontic treatment. In all patients fixed orthodontics was initiated with 0.022 inch slot brackets and NiTi 0.0014 inch wires. Salivary flow was estimated by collecting saliva before treatment, 6 weeks and 12 weeks after treatment. Salivary pH values were measured with portable pH meter strips. **Results:** Out of 56 patients, males were 20 and females were 36. Salivary flow rate before treatment was 1.15 mL/min which increased to 1.18 at 6 weeks and 1.29 at 12 weeks. The difference was significant ( $P < 0.05$ ). pH before treatment was 7.19, at 6 weeks was 6.54 and at 12 weeks was 6.03. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found reduction in pH and increase in salivary flow rate recorded at 6 weeks and 12 weeks after fixed orthodontic treatment.

**Key words:** Orthodontic, pH, Salivary flow

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#### INTRODUCTION

The quality (defined as salivary protein content, viscosity, pH and buffer capacity) and the quantity of saliva (mostly related to flow rate) play a crucial role in the equilibrium between demineralization and remineralization of enamel in a cariogenic environment. Specific changes, such as increased pH, buffer capacity and flow rate, may contribute to decreased susceptibility to dental caries.<sup>1</sup>

Orthodontic treatment of malocclusions can often resolve them, or at least prevent their progression.<sup>2</sup> However, complex design of fixed orthodontic appliances can affect the oral hygiene by influencing several parameters including the saliva properties and microbial count. Atack et al<sup>3</sup> were among the first to show the microbiological and periodontal changes that occur during the use of orthodontic appliances.

There is still no consensus on the way the quality and the quantity of saliva change during orthodontic treatment. Patients who undergo orthodontic therapy have oral ecologic changes because increased retentive sites for retention of food particles, which allows the bacterial growth. Lesions developed during orthodontic treatment

could be radicular resorption, gingival recession and increase of caries risk and periodontal diseases. The enamel decalcification is one of the most common and undesirable complications of the orthodontic therapy.<sup>4</sup> The present study was conducted to assess effect of orthodontic fixed appliances on salivary flow and viscosity.

#### MATERIALS & METHODS

The present study was conducted in the department of Orthodontics. It comprised of 56 patients of both genders undergoing fixed orthodontic treatment. The study design was approved from ethical committee. All patients were informed and written consent was obtained.

Patient information such as name, age, gender etc. was recorded.

In all patients fixed orthodontics was initiated with 0.022 inch slot brackets and NiTi 0.0014 inch wires. Salivary flow was estimated by collecting saliva before treatment, 6 weeks and 12 weeks after treatment. Non stimulated saliva was collected in sterile tube for assessment. Salivary pH values were measured with portable pH

meter strips. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of patients**

<b>Total- 56</b>		
<b>Gender</b>	<b>Males</b>	<b>Females</b>
Number	20	36

Table I shows that out of 56 patients, males were 20 and females were 36.

**Table II Salivary flow rate**

Time	Flow (mL/min)	P value
Before treatment	1.15	0.05
At 6 weeks	1.18	
12 weeks	1.29	

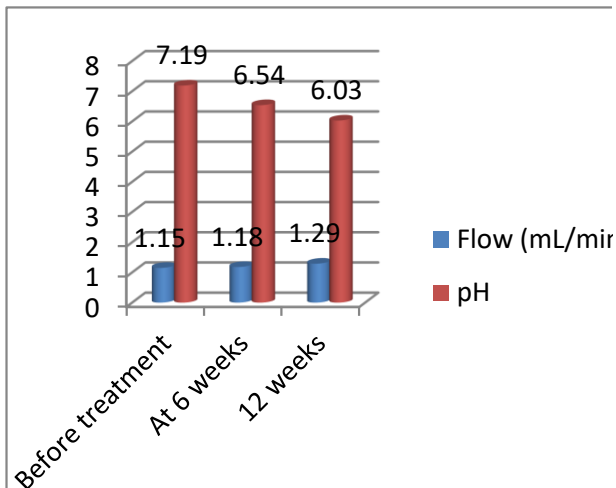
Table II shows that salivary flow rate before treatment was 1.15 mL/min which increased to 1.18 at 6 weeks and 1.29 at 12 weeks. The difference was significant (P< 0.05).

**Table III pH value of saliva**

Time	pH	P value
Before treatment	7.19	0.01
At 6 weeks	6.54	
12 weeks	6.03	

Table III shows that pH before treatment was 7.19, at 6weeks was 6.54 and at 12 weeks was 6.03. The difference was significant (P< 0.05).

**Graph I Salivary flow rate and pH**



**DISCUSSION**

Saliva is a fluid present in mouth that comes from major and minor glands. Saliva is essential for the protection of the tooth against dental caries and protects the integrity of the soft oral tissues, facilitates the mastication, the swallowing and the speech, as well as the sensibility and the digestive functions in the oral cavity. Near 99 % of saliva is water, 1% remaining consists of a complex mixture of constituent to different concentrations.<sup>5</sup>

Many studies have been conducted to determine the changes of microbial environment in patients undergoing fixed orthodontic treatment. On the other hand, a few previous reports have tried to investigate the relationship between fixed orthodontic appliances and the changes of nonmicrobial salivary properties, mostly with conflicting outcomes and short-term assessment (up to 6 months from bracket placement). Placement of fixed orthodontic appliances compromises the patients’ oral hygiene not only by impeding oral hygiene procedures, but also by changing the saliva properties and microbial count.<sup>6,7</sup> The present study was conducted to assess effect of orthodontic fixed appliances on salivary flow and viscosity.

In this study, out of 56 patients, males were 20 and females were 36. We observed that salivary flow rate before treatment was 1.15 mL/min which increased to 1.18 at 6 weeks and 1.29 at 12 weeks. Mummolo et al<sup>8</sup> conducted a study to evaluate the salivary flow rate, pH and buffer capacity prior to the beginning of therapy and after 1 year from bracket placement using a simple and commercially available chairside saliva check kit. The study population consisted of 20 healthy patients (mean age, 16.5 ± 4 years) scheduled for fixed orthodontic treatment. Salivary samples were taken just before bracket bonding (T0; baseline assessment) and after 1 year of treatment using the GC Saliva-Check Kit. No statistically significant difference was detected between T0 and T1 for the salivary parameters.

We found that pH before treatment was 7.19, at 6weeks was 6.54 and at 12 weeks was 6.03. Buffer capacity is the saliva ability to neutralize acids, salivary pH back to normal parameters after bacterial acidogenesis. After exposure to fermentable carbohydrate occur a series of reactions with decreasing pH, as it decreases, some salivary minerals and proteins are liberate to avoid the salivary pH drop. Increased salivary buffering minimizes the final products of the acidogenic bacteria.<sup>9</sup>

Alessandri et al<sup>10</sup> conducted a study to evaluate the changes in saliva properties and oral microbial flora in patients undergoing fixed orthodontic treatment. Two important saliva properties namely the salivary flow rate and pH as well as oral microbial flora were assessed in 30 orthodontic patients before starting fixed orthodontic treatment and after six, 12 and 18 weeks of treatment. Selective media, Sabouraud dextrose agar, Mitis salivarius agar and Rogosa agar were used for isolation of Candida albicans, Streptococcus mutans and Lactobacillus acidophilus, respectively. After six, 12 and 18 weeks of commencing fixed orthodontic treatment, the total colony counts of Candida albicans, Streptococcus mutans and Lactobacillus acidophilus showed a significant increase. The saliva pH decreased during the orthodontic treatment while the salivary flow did not change significantly.

**CONCLUSION**

Authors found reduction in pH and increase in salivary flow rate recorded at 6 weeks and 12 weeks after fixed orthodontic treatment.

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