

# Evaluation of impact of fixed orthodontic treatment on salivary pH

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## Abstract

**Background:** The present study was undertaken for assessing the effect of fixed orthodontic treatment on salivary pH.

**Materials & methods:** 25 patients undergoing fixed orthodontic treatment were enrolled. Clinical and radiographic details were also recorded separately. The pH values were measured with portable pH meter strips at the same four time points. Measurement of pH was done at baseline, 6 weeks post initiation of fixed orthodontic treatment, 12 weeks post initiation of fixed orthodontic treatment, and 18 weeks post initiation of fixed orthodontic treatment.

**Results:** Mean pH at baseline, 6 weeks post initiation of fixed orthodontic treatment, 12 weeks post initiation of fixed orthodontic treatment, and 18 weeks post initiation of fixed orthodontic treatment was found to be 7.18, 6.62, 6.89 and 6.99 respectively. While analyzing statistically, significant results were obtained.

**Conclusion:** During the course of fixed orthodontic treatment, there is a significant fall salivary pH.

**Key words:** Orthodontic treatment, pH

## INTRODUCTION

Malocclusion is considered as the third most common oral problem following dental caries and periodontal diseases. Most malocclusions are treated by fixed orthodontic appliances as a second phase following orthopedic treatment, as a comprehensive treatment after cessation of growth, or as a preparatory stage for orthognathic surgery.<sup>1, 2</sup> Treatment of malocclusion with fixed orthodontic appliances is estimated to last from 18 to 36 months. As they are termed “fixed appliances,” they are fitted permanently to the teeth, creating plaque-retentive areas around the bracket wings. This increases chances for plaque accumulation and bacterial colonization. The main formed colonies of specific interest are the acid-producing bacteria *Streptococcus mutans* and *Lactobacilli*.<sup>3, 4</sup> Simultaneous presence of this bacterium with *Lactobacillus acidophilus* and their synergistic association increase the incidence and severity of dental caries. *Candida* species have also been isolated from dental plaques and caries.<sup>5, 6</sup> Hence; the present study was undertaken for assessing the effect of fixed orthodontic treatment on salivary pH.

## MATERIALS & METHODS

25 patients scheduled to undergo orthodontic treatment were enrolled. Complete demographic details of all the patients were obtained. Clinical and radiographic details were also recorded separately. The pH values were measured with portable pH meter strips at the same four time points. Measurement of pH was done at baseline, 6 weeks post initiation of fixed orthodontic treatment, 12 weeks post initiation of fixed orthodontic treatment, and 18 weeks post initiation of fixed orthodontic treatment. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Student t test and one way ANOVA were used for evaluation of level of significance.

## RESULTS

In the present study, a total of 25 patients scheduled to undergo fixed orthodontic treatment were analyzed. Mean age of the patients was found to be 13.9 years. There were 14 males and 11 females. Mean pH at baseline, 6 weeks post initiation of fixed orthodontic treatment, 12 weeks post initiation of fixed orthodontic treatment, and 18 weeks post initiation of fixed orthodontic treatment was found to be 7.18, 6.62, 6.89 and 6.99 respectively. While analyzing statistically, significant results were obtained.

Table 1: Demographic data

Parameter		Number	Percentage
Age group (years)	Less than 15	15	60
	More than 15	10	40
Gender	Males	14	56
	Females	11	44

Table 2: Change in pH with time

Time (weeks)	pH	p- value
Zero	7.18	0.00 (Significant)
Six	6.62	
Twelve	6.89	
Eighteen	6.99	

## DISCUSSION

The oral cavity can be described as a vastly complex environment, where numerous synergistic and antagonistic interactions take place at different times among its elements. The kingpin in this environment is saliva, secreted by glands, which formed by water (99%) and other compounds (1%): Glucose, electrolytes (chloride ions, bicarbonates, phosphates, sodium ions, magnesium ions and calcium ions), nitrogen compounds (ammonia, urea) and proteins: enzymes, immunoglobulines, mucosal glycoproteins, albumins, oligopeptides, polypeptides and aquaporins and any additional constituent that may enhance the complexity of the oral environment in a variety of ways. Fixed orthodontic appliances introduce an additional constituent to the oral cavity complex that may enhance environment in a variety of ways. On the other hand, Orthodontic treatment leads to changes in the oral environmental factors that encourage changes in salivary flow rate, viscosity, pH, bacterial count, increased plaque index, and other more things which all are factors supplement the risk of caries activity and shake the stability of the oral environment.<sup>7- 10</sup> Hence; the present study was undertaken for assessing the effect of fixed orthodontic treatment on salivary pH.

In the present study, a total of 25 patients scheduled to undergo fixed orthodontic treatment were analyzed. Mean age of the patients was found to be 13.9 years. There were 14 males and 11 females. Mean pH at baseline, 6 weeks post initiation of fixed orthodontic treatment, 12 weeks post initiation of fixed orthodontic treatment, and 18 weeks post initiation of fixed orthodontic treatment was found to be 7.18, 6.62, 6.89 and 6.99 respectively. While analyzing statistically, significant results were obtained. Al-Haifi HAA et al compared the short-term effects of stainless steel (SS) versus elastomeric (EM) ligatures on salivary pH in patients scheduled for fixed orthodontic treatment. Seventy participants were enrolled in the study (54 female, 16 male) aged 19–36 years who met specific inclusion criteria. They were randomly selected and allocated into two equal groups through computer-generated randomization. All patients received fixed orthodontic treatment using conventional orthodontic brackets. Two commonly used archwire ligature methods were used: SS and EMs. An unstimulated (resting) salivary sample was collected before tying of the ligatures at T0 (baseline), 2 weeks, 6 (weeks), and 12 (weeks). Salivary pH was measured using a digital pH meter. The salivary pH level was stable between T0 and T1 ( $6.72 \pm 0.14$ ), then significantly and progressively increased from T1 to T2 ( $6.78 \pm 0.13$ ) and from T2 to T3 ( $6.81 \pm 0.14$ ) with ( $p < 0.05$ ) in the SS group. In the EM group, the salivary pH level was significantly decreased in all follow-up periods; T0 ( $6.77 \pm 0.16$ ), T1 ( $6.72 \pm 0.14$ ), T2 ( $6.67 \pm 0.13$ ) and T3 ( $6.64 \pm 0.13$ ). The EM ligatures showed a significant decrease in salivary pH to an unfavorable level, which increased the risk of enamel demineralization.<sup>11</sup> Arab et al evaluated 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 ( $P < 0.05$ ) while the

salivary flow did not change significantly. Fixed orthodontic treatment causes major changes in the saliva properties.<sup>12</sup>

## CONCLUSION

During the course of fixed orthodontic treatment, there is a significant fall salivary pH. However; further studies are recommended.

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