

Original Research

Effect of orthodontic treatment on salivary flow rate and salivary pH

Prakhar Pathak¹, Lokendra Singh Dagur², Gunjan Pathak³, Aditi Tak⁴, Ramiz Raja Mallick⁵, Himani Kapila⁶

¹Senior Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Jaipur Dental College

²Assistant Professor, Department of Orthodontics and Dentofacial Orthopaedics, Jaipur Dental College

³Private Practitioner, Gwalior

⁴Senior lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Maharaja Ganga Singh dental college and research Center

⁵3rd Year MDS (PG) student, Department of Orthodontics and Dentofacial Orthopaedics, Maharaja Ganga Singh dental college and research Center

⁶BDS Lecturer, Department of public health dentistry, Desh Bhagat dental college and hospital, Mandi Gobindgarh

ABSTRACT:

Background: Orthodontic treatment of malocclusions can often resolve them, or at least prevent their progression. Hence; the present study was conducted for assessing the effect of orthodontic treatment on salivary flow rate and salivary pH.

Materials & methods: A total of 20 patients scheduled to undergo fixed orthodontic treatment were enrolled. All subjects were treated with a straight wire technique on both the maxillary and the mandibular arches. Before the beginning of treatment, all patients underwent meticulous professional oral hygiene. Every 3 months during active orthodontic treatment, all subjects underwent professional oral hygiene maintenance; more frequent hygienic check-ups were scheduled in the presence of clinical signs of unhealthy gingival conditions. Salivary flow rate and salivary pH was evaluated. **Results:** Mean salivary flow rate at baseline, 1 month, 2 months and 6 months was 1.06 mL/min, 1.19 mL/min, 1.29 mL/min and 1.39 mL/min respectively. Mean salivary pH at baseline, 1 month, 2 months and 6 months was 7.26, 6.95, 6.75 and 6.56 respectively. Significant results were obtained while comparing the salivary pH and salivary flow rate at different time intervals. **Conclusion:** Salivary pH and salivary flow rate are significantly altered in patients undergoing fixed orthodontic treatment.

Key words: Orthodontic treatment

Received: 27 May, 2021

Accepted: 30 June, 2021

Corresponding author: Dr. Prakhar Pathak, Senior Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, Jaipur Dental College

This article may be cited as: Pathak P, Dagur LS, Pathak G, Tak A, Mallick RR, Kapila H. Effect of orthodontic treatment on salivary flow rate and salivary pH. Int J Res Health Allied Sci 2021; 7(4):86-88.

INTRODUCTION

Malocclusion is one of the most common dental disorders and is capable of increasing the risk of periodontal disease and dental caries. Orthodontic treatment of malocclusions can often resolve them, or at least prevent their progression. However, complex design of fixed orthodontic appliances can affect the oral hygiene by influencing several parameters including the saliva properties and microbial count. Changes in the saliva parameters such as decrease in pH, flow rate and buffering capacity of the saliva may

contribute to enamel demineralization and increase the susceptibility to dental caries.¹⁻⁴

All these salivary properties become of utmost importance during orthodontic treatment with fixed appliances, when an increased chance of plaque retention and a greater difficulty in optimal oral hygiene maintenance are thought to predispose to enamel demineralization and white spot formation. There is still no consensus on the way the quality and the quantity of saliva change during orthodontic treatment. So far, investigations have been confined to

the first 6 months from the placement of fixed appliances, and no data are yet available in the long term.⁵⁻⁷ Hence; the present study was conducted for assessing the effect of orthodontic treatment on salivary flow rate and salivary pH.

MATERIALS & METHODS

The present study was conducted for assessing the effect of orthodontic treatment on salivary flow rate and salivary pH. A total of 20 patients scheduled to undergo fixed orthodontic treatment were enrolled. All subjects were treated with a straight wire technique on both the maxillary and the mandibular arches. Before the beginning of treatment, all patients underwent meticulous professional oral hygiene. Oral hygiene instructions were given after fixed appliance placement, followed by proper reinforcement on each orthodontic adjustment appointment. Every 3 months during active orthodontic treatment, all subjects underwent professional oral hygiene maintenance; more frequent hygienic check-ups were scheduled in the presence of clinical signs of unhealthy gingival conditions. Salivary flow rate and salivary pH was evaluated. All the results were recorded and analyzed by SPSS software. Student t test was used for evaluation of level of significance.

RESULTS

In the present study, a total of 20 subjects were analyzed. Mean salivary flow rate at baseline, 1 month, 2 months and 6 months was 1.06 mL/min, 1.19 mL/min, 1.29 mL/min and 1.39 mL/min respectively. Mean salivary pH at baseline, 1 month, 2 months and 6 months was 7.26, 6.95, 6.75 and 6.56 respectively. Significant results were obtained while comparing the salivary pH and salivary flow rate at different time intervals.

Table 1: Comparison of salivary flow rate at different time intervals after initiation of fixed orthodontic treatment

Time interval	Salivary flow rate (mL/min)	p-value
Baseline	1.06	0.00
1 month	1.19	(Significant)
2 months	1.29	
6 months	1.39	

Table 2: Comparison of salivary pH at different time intervals after initiation of fixed orthodontic treatment

Time interval	Salivary pH	p-value
Baseline	7.26	0.00 (Significant)
1 month	6.95	
2 months	6.75	
6 months	6.56	

DISCUSSION

The salivary flow rate as an important saliva property plays a critical role in oral health. An increase in flow rate promotes the physical cleansing action of the saliva, increases its antimicrobial activities, and

accelerates clearance of substrates. On the other hand, low saliva secretion rate adversely affects oral health.⁸⁻¹⁰ Hence; the present study was conducted for assessing the effect of orthodontic treatment on salivary flow rate and salivary pH.

In the present study, a total of 20 subjects were analyzed. Mean salivary flow rate at baseline, 1 month, 2 months and 6 months was 1.06 mL/min, 1.19 mL/min, 1.29 mL/min and 1.39 mL/min respectively. Mean salivary pH at baseline, 1 month, 2 months and 6 months was 7.26, 6.95, 6.75 and 6.56 respectively. V Anu et al investigated the changes in stimulated and unstimulated salivary flow rate, pH and buffer capacity in patients undergoing therapy with fixed orthodontic appliances. Salivary flow rate, pH and buffering capacity of 20 patients who underwent fixed orthodontic treatment were examined using GC saliva check buffer kit. The procedure was carried out during the initiation of orthodontic treatment and subsequently, one month and six months after the placement of appliance. Results showed there was a significant increase in the salivary flow rate one month and six months after placement of fixed appliance while pH and buffering capacity showed no significant changes. Salivary flow rate increases significantly during fixed orthodontic treatment.¹⁰

In the present study, significant results were obtained while comparing the salivary pH and salivary flow rate at different time intervals. H S Chang et al investigated the changes in stimulated salivary flow rate, pH, buffer capacity, and the levels of mutans streptococci (MS) and lactobacilli in patients undergoing therapy with fixed orthodontic appliances. Saliva samples, plaque index scores and dietary histories were taken from 21 sequential patients before the start of treatment, and one month and three months after placement of brackets and bands. 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 three months of active treatment. It is postulated that the balance between the cariogenic challenge posed by high levels of MS and lactobacilli, and the reparative effects of concurrent increases in salivary flow rate, pH and buffer capacity, determines the likelihood of mineral loss or gain over time. A failure to follow basic preventive measures may increase the risk for some patients of enamel decalcification during orthodontic treatment with fixed appliances.¹¹ Arab S 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.¹²

CONCLUSION

Salivary pH and salivary flow rate are significantly altered in patients undergoing fixed orthodontic treatment.

REFERENCES

1. Shivakumar K, Chandu G, Shafiulla M. Severity of malocclusion and orthodontic treatment needs among 12-to 15-year-old school children of Davangere District, Karnataka, India. *Eur J Dent.* 2010;4:298–307.
2. Bollen AM, Cunha-Cruz J, Bakko DW, Huang GJ, Hujoel PP. The effects of orthodontic therapy on periodontal health: A systematic review of controlled evidence. *J Am Dent Assoc.* 2008;139:413–22.
3. Zachrisson S, Zachrisson BU. Gingival condition associated with orthodontic treatment. *Angle Orthod.* 1972;42:26–34.
4. Marsh PD. Microbial ecology of dental plaque and its significance in health and disease. *Adv Dent Res.* 1994. July; 8 (2): 263– 71.
5. Ahn SJ, Lee SJ, Lim BS, Nahm DS. Quantitative determination of adhesion patterns of cariogenic streptococci to various orthodontic brackets. *Am J Orthod Dentofacial Orthop.* 2007. December; 132 (6): 815– 21.
6. Badet C, Thebaud NB. Ecology of lactobacilli in the oral cavity: a review of literature. *Open Microbiol J.* 2008; 2: 38– 48.
7. Hägg U, Kaveewatcharanont P, Samaranayake YH, Samaranayake LP. The effect of fixed orthodontic appliances on the oral carriage of *Candida* species and *Enterobacteriaceae*. *Eur J Orthod.* 2004. December; 26 (6): 623– 9.
8. Atack NE, Sandy JR, Addy M. Periodontal and microbiological changes associated with the placement of orthodontic appliances. A review. *J Periodontol.* 1996. February; 67 (2): 78– 85
9. Madlena M, Vitalyos G, Marton S, Nagy G. Effect of chlorhexidine varnish on bacterial levels in plaque and saliva during orthodontic treatment. *J Clin Dent.* 2000; 11 (2): 42– 6.
10. V Anu et al. Salivary flow rate, pH and buffering capacity in patients undergoing fixed orthodontic treatment - A prospective study. *Indian J Dent Res.* Jul-Aug 2019;30(4):527-530.
11. H S Chang. The effect of orthodontic treatment on salivary flow, pH, buffer capacity, and levels of mutans streptococci and lactobacilli. *Aust Orthod J.* 1999 Apr;15(4):229-34.
12. Arab S, Nouhzadeh Malekshah S, Abouei Mehrizi E, Ebrahimi Khanghah A, Naseh R, Imani MM. Effect of Fixed Orthodontic Treatment on Salivary Flow, pH and Microbial Count. *J Dent (Tehran).* 2016;13(1):18-22.