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Assessment of Variations Occurring in Salivary Levels of Osteoprotegerin During Orthodontic Tooth Movement: A Clinical Study

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ABSTRACT

Background: Basic principle behind orthodontic treatment is that when force is delivered to a tooth certain mechanical, chemical and cellular events take place within these tissues which allow for structural alterations and contribute to the movement of that tooth. Hence; we planned the present study to assess the variations occurring in salivary levels of osteoprotegerin (OPG) during orthodontic tooth movement.

Materials & methods: A total of 30 subjects were included in the present study. Fixed orthodontic treatment was started in all the patients. Unstimulated salivary sample was obtained in all the patients. All the samples were collected in the morning and were sent to the pathology department for estimation of salivary levels of osteoprotegerin. Salivary sample collection was done at three different stages; At baseline- Before the starting of the treatment, At 24 hours after the starting of the fixed orthodontic treatment, and One month after the starting of the treatment. Estimation of osteoprotegerin levels was done using ELISA technique.

Results: Mean OPG levels at baseline was found to be 1.02 pg/mL. At 24 hours after the starting of the fixed orthodontic treatment, mean OPG levels were found to be 1.41pg/mL One month after the starting of the treatment, mean OPG levels were found to be 1.19 pg/mL. We observed a significant rise in the OPG levels after the starting of the fixed orthodontic treatment, followed by a significant decline to the OPG levels to the baseline range.

Conclusion: There might be some correlation between salivary OPG levels and different stages of orthodontic tooth movement.

Keywords: Osteoprotegerin, Orthodontic, Tooth.

INTRODUCTION

Orthodontic treatment is based on the premise that when force is delivered to a tooth and thereby transmitted to the adjacent investing tissues, certain mechanical, chemical and cellular events take place within these tissues which allow for structural alterations and contribute to the movement of that tooth.[1-3] Osteoclastogenesis, in particular, is controlled by three members of the tumor necrosis factor (TNF) and TNF receptor superfamily, receptor activator of nuclear factor kappa B ligand (RANKL), receptor activator of nuclear factor kappa B (RANK), and osteoprotegerin (OPG).[4-6] Hence; under the light of above obtained data, we planned the present study to assess the

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variations occurring in salivary levels of osteoprotegerin during orthodontic tooth movement.

MATERIALS & METHODS

The present study was conducted in the department of orthodontics of the dental institute and it included assessment of variations occurring in salivary levels of osteoprotegerin during orthodontic tooth movement. Ethical approval was obtained from institutional ethical committee and written consent was obtained from all the subjects after explaining in detail the entire research protocol. A total of 30 subjects were included in the present study. Inclusion criteria for the present study included:

- Patients within the age group of 17 to 25 years,
- Patients with healthy periodontal status
- Patients with negative history of any bone related pathology,
- Patients with negative history of any other systemic illness or any metabolic disorder

Fixed orthodontic treatment was started in all the patients. Unstimulated salivary sample was obtained in all the patients. All the samples were collected in the morning and were sent to the pathology department for estimation of salivary levels of osteoprotegerin. Salivary sample collection was done at three different stages; At baseline- Before the starting of the treatment, At 24 hours after the starting of the fixed orthodontic treatment, and One month after the starting of the treatment. Estimation of osteoprotegerin levels was done using ELISA technique. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test was used for evaluation of level of significance.

RESULTS

In the present study, a total of 30 subjects were analysed. Mean age of the subjects in the present study was 11.4 years. There were 18 males and 12 females in the present study. Mean OPG levels at baseline was found to be 1.02 pg/mL. At 24 hours after the starting of the fixed orthodontic treatment, mean OPG levels were found to be 1.41pg/mL. One month after the starting of the treatment, mean OPG levels were found to be 1.19 pg/mL. We observed a significant rise in the OPG levels after the starting of the fixed orthodontic treatment, followed by a significant decline to the OPG levels to the baseline range.

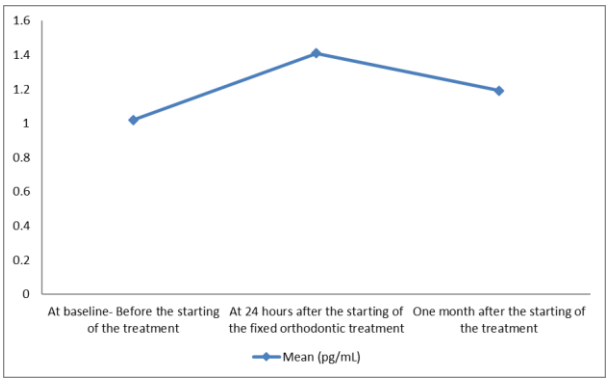
Table 1: Demographic data.

Parameter		Number	Percentage
Age group (years)	Less than 10	10	33.3
	10 to 12	12	40
	More than 12	8	26.7
Gender	Males	18	60
	Females	12	40

Table 2: Mean OPG levels at different time intervals.

Time interval	Mean (pg/mL)	p- value
At baseline- Before the starting of the treatment	1.02	0.02
At 24 hours after the starting of the fixed orthodontic treatment	1.41	
One month after the starting of the treatment	1.19	

Graph1: Mean OPG levels at different time intervals



DISCUSSION

Orthodontics comprise of tooth movement in the jaw from one position to another to attain aesthetics. It has always been interesting for clinicians to understand the basic concept of tooth movement, so that the treatment time could be reduced, resulting in patient satisfaction. A lot of research has been done on the mechanical forces and tooth movement compared to the focus on cellular biology. The principle of tooth movement in

which applied pressure results in remodeling is a microscopic fact. Although, there are lot of innovative mechanical devices for tooth movement but still we have not been totally successful in preventing periodontal injuries. This could be due to lack of complete cellular understanding.[7- 10]

In the present study, a total of 30 subjects were analysed. Mean age of the subjects in the present study was 11.4 years. There were 18 males and 12 females in the present study. Flórez-Moreno GA et al determined whether the variations in salivary concentrations of soluble receptor activator of nuclear factor kappa B ligand (sRANKL) and osteoprotegerin (OPG), and their ratios, might be linked with the different phases of orthodontic tooth movement. Twenty healthy subjects who required fixed appliance therapy not involving tooth extractions or surgical procedures were selected. Unstimulated whole saliva samples were collected from each patient before fitting the orthodontic appliances, and at 24 to 48 hours, 2 weeks, 5 weeks, and 8 weeks after the activation. Salivary sRANKL and OPG concentrations were determined by enzyme-linked immunosorbent assays.Overall, median values of sRANKL showed significant increases, median OPG salivary values showed a significant downward trend, and the sRANKL/OPG ratio tended to increase significantly over time after the activation visit. However, clear fluctuations in the immunoenzymatic findings were noted at the different sampling times, indicating nonlinear trends in the levels of the biomarkers through time. Post-hoc pairwise comparisons showed significant differences between (1) all sRANKL values relative to those of the 8-week sampling time; (2) baseline/8-week OPG salivary levels; and (3) baseline, 24 to 48 hours, and 2-week sRANKL/OPG ratios compared with those of the 8-week test. The findings indicated that variations in salivary concentrations of sRANKL and OPG and their ratios might be linked to the different phases of orthodontic tooth movement.[11]

In the present study, mean OPG levels at baseline was found to be 1.02 pg/mL. At 24 hours after the starting of the fixed orthodontic treatment, mean OPG levels were found to be 1.41pg/mL. One month after the starting of the treatment, mean OPG levels were found to be 1.19 pg/mL. We observed a significant rise in the OPG levels after the starting of the fixed orthodontic treatment, followed by a significant decline to the OPG levels to the baseline range.Tabari ZA et al evaluated the use of the salivary soluble RANKL (sRANKL)/OPG ratio as a diagnostic marker for periodontitis in nonsmokers. Twenty-five patients with chronic periodontitis and 25 individuals with a healthy periodontium were enrolled in this study. Samples containing 5 mL of unstimulated saliva were obtained from each subject. Salivary sRANKL and OPG concentrations were determined using a standard enzyme-linked immunosorbent assay.The levels of sRANKL and OPG were detectable in all of the samples. Positive relationships were found between the plaque index and clinical attachment level and both the salivary concentration of sRANKL and the salivary sRANKL/OPG ratio ($P<0.05$). The salivary concentration of sRANKL and the sRANKL/OPG ratio were significantly higher in the periodontitis group than in the healthy group ($P=0.004$ and $P=0.001$, respectively). In contrast, the OPG concentration showed no significant differences between the groups ($P=0.455$). These findings suggested that the salivary sRANKL/OPG ratio may be helpful in the screening and diagnosis of periodontitis.[12]

CONCLUSION

Under the light of above mentioned data, the authors conclude that there might be some correlation between salivary OPG levels and different stages of orthodontic tooth movement. However; further studies are recommended.

CONFLICTS OF INTEREST

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

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