Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies **NLM ID:** 101716117

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 91.86

(e) ISSN Online: 2321-9599;

(p) ISSN Print: 2348-6805

Original Research

Analysis of Pentraxin-3 (PTX-3) levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment

¹Amruta Yerawar, ²Prashant Khot, ³Pratik Jadhav

¹Senior Lecturer, Saraswati Dhanwantari Dental College and Hospital, Post Graduate Research Institute, Parbhani, Maharashtra, India;

²Khot Dental Clinic, Kavathemahankal, Maharashtra, India;

³Consultant Orthodontist, Mumbai, Maharashtra, India

ABSTRACT:

Background: The present study was conducted for assessing the Pentraxin-3 levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment. **Materials & methods:** Forty patients were enrolled in the present study which was scheduled to undergo fixed orthodontic treatment. GCF samples were obtained from all the subjects and PTX-3 levels were evaluated. Evaluation of the GCF samples was done at three time intervals, baseline, 24 hours after starting of fixed orthodontic treatment, and 1 week after starting of fixed orthodontic treatment. Collection of GCF was done from the mesial side of maxillary canines. Isolation of the area was done with the help of cotton rolls. Supragingival plaque was removed with a curette without touching the marginal gingiva. Gentle drying of the site was done with an air syringe. All the samples were sent to laboratory where an auto-analyser was used for evaluation of PTX-3 levels. **Results:** At baseline, 24 hours after starting of fixed orthodontic treatment, the mean PTX-3 levels were 0.89 ng/ml, 2.12 ng/ml and 1.39 ng/ml respectively. Significant results were obtained while comparing the mean PTX-3 levels among patients at different time intervals. **Conclusion:** Significant alteration of PTX-3 levels in the GCF does occur during the course of orthodontic treatment highlighting the role of inflammation in orthodontic tooth movement. **Key words:** Pentraxin, Orthodontic treatment

Received: 13 March, 2022

Accepted: 17 April, 2022

Corresponding author: Pratik Jadhav, Consultant Orthodontist, Mumbai, Maharashtra, India

This article may be cited as: Yerawar A, Khot P, Jadhav P. Analysis of Pentraxin-3 (PTX-3) levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment. J Adv Med Dent Scie Res 2022;10(5):13-15.

INTRODUCTION

Orthodontic treatment involves use of various forms of mechanical forces for the induction of bone remodeling with the purpose of correcting various forms of dental malocclusions. On the pressure side of the forces, resorption of the bone occurs, whereas on the tension side, deposition of the bone occurs. One of the common orthodontic treatment procedures used after the extraction of first premolars is canine retraction, which is followed by incisor retraction. Various extraoral and intraoral mechanics are employed for the conservation of anchorage in cases with maximum anchorage use. Mini-screws serve as one of the best intraoral methods for conserving the anchorage.^{1- 3}Tooth movement can be classified into physiological tooth movement and orthodontic tooth movement (OTM). The humoral arm of the innate immune response includes components of the complement cascade and soluble pattern recognition molecules (PRM), particularly long pentraxin 3 [PTX3]).^{4, 5} Hence; the present study was conducted for assessing the Pentraxin-3 levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment.

MATERIALS & METHODS

The present study was conducted for assessing the Pentraxin-3 levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment. Forty patients were enrolled in the present study which was scheduled to undergo fixed orthodontic treatment. GCF samples were obtained from all the subjects and PTX-3 levels were evaluated. Evaluation of the GCF samples was done at three time intervals, baseline, 24 hours after starting of fixed orthodontic treatment, and 1 week after starting of fixed orthodontic treatment. Collection of GCF was done from the mesial side of

maxillary canines. Isolation of the area was done with the help of cotton rolls. Supragingival plaque was removed with a curette without touching the marginal gingiva. Gentle drying of the site was done with an air syringe. All the samples were sent to laboratory where an auto-analyser was used for evaluation of PTX-3 levels. All the results were recorded in Microsoft excel sheet and one way ANOVA was used for evaluation of level of significance.

Table 1: Comparison of PTX-3 levels

RESULTS

A total of forty subjects were enrolled. Mean age of the subjects was 15.6 years. There were 25 males and 15 females among the forty subjects enrolled in the present study. At baseline, 24 hours after starting of fixed orthodontic treatment and 1 week after starting of fixed orthodontic treatment, the mean PTX-3 levels were 0.89 ng/ml, 2.12 ng/ml and 1.39 ng/ml respectively. Significant results were obtained while comparing the mean PTX-3 levels among patients at different time intervals.

ible 11 Comparison of 1 174 5 levels		
Time interval	Mean PTX-3 levels (ng/ml)	p- value
Baseline	0.89	0.002
24 hours after starting of fixed orthodontic treatment	2.12	(Significant)
1 week after starting of fixed orthodontic treatment	1.39	

DISCUSSION

The innate immune system is equipped with a number of germ-line encoded soluble pattern recognition molecules (PRMs) that collectively mediate the humoral host response to infection and damage in cooperation with cells and tissues of the immune and non-immune compartments. Despite the impressive diversity in structure, source, and regulation across PRMs, these all share remarkably similar functions inasmuch as they recognize microbes and damaged tissues, activate complement, exert opsono-phagocytic activities, and regulate inflammation. The long pentraxin 3 (PTX3) is a prototypic soluble PRM. Long known as a major player in innate immunity, inflammation and matrix remodeling, only recently has PTX3 emerged as a mediator of bone homeostasis in rodents and humans.⁶⁻¹⁰ Hence; the present study was conducted for assessing the Pentraxin-3 levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment.

A total of forty subjects were enrolled. Mean age of the subjects was 15.6 years. There were 25 males and 15 females among the forty subjects enrolled in the present study. At baseline, 24 hours after starting of fixed orthodontic treatment and 1 week after starting of fixed orthodontic treatment, the mean PTX-3 levels were 0.89 ng/ml, 2.12 ng/ml and 1.39 ng/ml respectively. Abrol N et al assessed the Pentraxin-3 levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment. Total of 20 patients were enrolled in the present study which was scheduled to undergo fixed orthodontic treatment. Mean PTX-3 levels at Baseline, 4 hours after starting of fixed orthodontic treatment, 24 hours after starting of fixed orthodontic treatment and 1 week after starting of fixed orthodontic treatment were found to be 0.95 ng/ml, 1.28 ng/ml, 2.45 ng/ml and 1.2 ng/ml respectively. While analysing statistically, it was observed that mean PTX-3 levels increased significantly till 24 hours after starting of the fixed orthodontic treatment to three times of its baseline values, and further declining significantly to its baseline range at 1 week after starting of fixed orthodontic treatment. Conclusion: Significant alteration of PTX-3 levels in the GCF does occur during the course of orthodontic treatment highlighting the role of inflammation in orthodontic tooth movement.¹¹

Significant results were obtained while comparing the mean PTX-3 levels among patients at different time intervals. Thukral R et al compared the level of PTX-3 in patients undergoing canine retraction with active tieback and Nickel-Titanium (NiTi) coil spring. 25 patients that underwent canine retraction as a part of fixed orthodontic treatment were assessed. In the maxillary right and left quadrant, active tieback and NiTi coil spring were used respectively. Gingival crevicular fluid samples were collected 1 hour prior to the commencement of orthodontic canine retraction procedure followed by collection at following time intervals: 1 hour, 1, 7, and 14 days after the start of canine retraction procedure. Enzyme-linked immunosorbent assay kit was used for analysis of the samples as per manufacturer's instructions. All the data were recorded and compiled. Nonsignificant difference was observed in the values of PTX-3 at baseline and 1 hour. While comparing the mean PTX-3 values between different time intervals in both the study groups, significant difference was observed. In comparison to the active tieback, NiTi coil exhibited faster space closure rate.12

CONCLUSION

Significant modification of GCF PTX-3 levels occursunder the action of orthodontic forces reinforcing the concept of their role of inflammation in orthodontic tooth movement.

REFERENCES

 Mairuhu A. T, Peri G, Setiati T. E, et al. Elevated plasma levels of the long pentraxin, pentraxin 3, in severe dengue virus infections. J Med Virol. 2005;76:547–552.

- 2. Sprong T, Peri G, Neeleman C, et al. Pentraxin 3 and C-reactive protein in severe meningococcal disease. Shock. 2009;31:28–32.
- Hill A. L, Lowes D. A, Webster N. R, Sheth C. C, Gow N. A, Galley H. F. Regulation of pentraxin-3 by antioxidants. Br J Anaesth. 2009;103:833–839.
- 4. McLaughlin, RP.; Bennet, JC.; Trevisi, H. Systemised orthodontic treatment mechanics. 1st ed. London: Mosby; 2001. p. 275-277.
- Watanabe Y, Miyamoto K.Anickel titanium canine retraction spring. J ClinOrthod 2002 Jul;36(7):384-388.
- Goodman AR, Levy DE, Reis LF, Vilcek J. Differential regulation of TSG-14 expression in murine fibroblasts and peritoneal macrophages. J LeukocBiol 2000 Mar;67(3):387-395.
- Jaillon S, Peri G, Delneste Y, Frémaux I, Doni A, Moalli F, Garlanda C, Romani L, Gascan H, Bellocchio S, et al. The humoral pattern recognition receptor PTX3 is stored in neutrophil granules and localizes in extracellulartraps. J Exp Med 2007 Apr;204(4):793-804.
- Mantovani A, Garlanda C, Doni A, Bottazzi B. Pentraxins in innate immunity: from C-reactive protein to the long pentraxin PTX3. J ClinImmunol. 2008;28:1–13.
- Sueri Y. M, Turk T. Effectiveness of laceback ligatures on maxillary canine retraction. Angle Orthod. 2006;76:1010–1016.
- Offenbacher S, Odle B. M, Van Dyke T. E. The use of prostaglandin E2 levels as a predictor of periodontal attachment loss. J Periodont Res. 1986;21:101–112.
- Abrol N, Gupta R, Dhiman I, Saklani PS. Assessment of Pentraxin-3 levels during orthodontic tooth movement in patients undergoing fixed orthodontic treatment. Int J Res Health Allied Sci 2020; 6(2):33-36.
- Thukral R, Mangat S, Ganguly A, Agarkar SS, Bali H, Grover S. Pentraxin-3 Levels in Gingival Crevicular Fluid during Canine Retraction with Nickel–Titanium Coil Spring and Active Tieback. J Contemp Dent Pract 2017; 18(8):710-713.