Research Article

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Assessment of Dental Plaque Control in Patients Wearing Fixed Orthodontic Appliances

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ABSTRACT

Background: Dental plaque is the community of microorganisms found on a tooth surface as a biofilm embedded in a matrix of polymers of host and bacterial origin. Orthodontic treatment is often associated with severe plaque formation with microbial colonization on the gingival tissues. The use of ortho appliances in the mouth often triggers a quantitative alteration in the pathophysiology of the bacterial plaque.

Materials and methods: eighty-three patients were randomly divided in to three groups with three different plaque control methods. The manual toothbrush was assigned to group A, the electric toothbrush was assigned to group B, and the manual toothbrush with a mouthrinse was assigned to group C.

Results: Patients above 18 years consisted 30% of the total sample, whereas the subjects of 18 or above consisted 70 per cent. The mean age of the study population was 24.62 years. Out of 83 subjects, thirty (36.4%) were males, and the remaining 53(63.8%) were females.

Conclusion: The study showed that the group who used toothbrush with mouthrinse proved to be the best in maintain oral hygiene in orthodontic patients.

Keywords: Dental Plaque, gingival index, plaque index, orthodontic patients.

INTRODUCTION

Orthodontic dentistry tries to meet esthetic, dynamic and functional demands.[1] However, in order to be completely effective, orthodontic treatment needs to make sure that the integrity of dental and periodontal soft tissues.[2] Dental plaque is the community of microorganisms found on a tooth surface as a biofilm embedded in a matrix of polymers of host and bacterial origin.[3] The plaque formation consists of acquired pellicle formation; reversible adhesion involving weak long-range Physico-chemical interactions between the cell surface and the pellicle.[4] This progresses to stronger adhesin-receptor mediated attachment; co-adhesion resulting in attachment of secondary colonizers to already attached cells multiplication and biofilm formation.[4,5]

Orthodontic treatment is often associated with severe plaque formation with microbial colonization on the gingival tissues.[2,6] The use of ortho appliances in the mouth often triggers a quantitative alteration in the pathophysiology of the bacterial plaque.[7]

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The multiple braces system often aggravates the formation of plaque and reduces its elimination.[8] Consequently, it is essential to obtain strict control of dental plaque in patients fitted with fixed multibracket devices. Few studies have been shown to assess the efficacy of different mechanical and chemical hygiene measures in patients receiving fixed orthodontic treatment. The aim of the study is to assess the plaque and gingival indices in patients wearing fixed orthodontic appliances and to compare the impact of toothbrushing with a manual toothbrush, toothbrushing with an electric toothbrush.

MATERIALS AND METHODS

This study compared three different oral hygiene techniques. A sample of eighty-three patients was selected randomly from the outpatient's department of our institute. All the patients have explained the procedure in details, and written consent was taken. Ethical clearances were obtained from the concerned institute. Patients wearing lower and upper multibracket orthodontic appliances, subjects in good health, free from oral diseases were included in the study. Patients wearing removable appliances or prostheses, physically or mentally handicapped, having fewer than five teeth in each quadrant, severe inflammation, having periodontal pockets, and on antibiotics were excluded from the study.

The selected subjects were divided into three groups. The allocation of subjects was done by coin toss methods. Each group consisted of twenty-eight patients. Each group were assigned one particular method of oral hygiene and were asked to use it for a month. The manual toothbrush was assigned to group A, the electric toothbrush was assigned to group B, and the manual toothbrush with a mouthrinse was assigned to group C. At the beginning, patients were given instructions regarding oral hygiene, and the Loe-Silness gingival and plaque indices were recorded. The plaque indices were measured again by the same operator to reduce inter-examiner bias.

Statistical analysis:

Statistical analysis was performed using SPSS software (V22 for windows, Chi, USA).

RESULTS

All the samples in this study were divided into two groups. The first was patients below 18 years, and the second one was patients above the age of 18 years. Patients above 18 years consisted 30% of the total sample, whereas the subjects of 18 or above consisted 70 per cent. The mean age of the study population was 24.62 years. Out of 83 subjects, thirty (36.4%) were males, and the remaining 53(63.8%) were females. After evaluation of plaque index (PI) and the gingival index (GI), it showed that the mean PI value was 1.18 before the study and 0.85 after the observational period.

Table 1: PI and GI index values.

Values	N	Group A		Group B		Group C	
		Mean	SD	Mean	SD	Mean	SD
PI Before	28	1.18	0.332	1.11	0.239	0.90	0.399
PI After	28	0.85	0.378	0.58	0.223	0.50	0.212
GI Before	28	0.59	0.254	0.64	0.245	0.78	0.289
GI After	28	0.60	0.211	0.55	0.230	0.45	0.312
PI Before – PI After	28	0.31	0.390*	0.51	0.287*	0.38	0.287*
GI Before – GI After	28	-0.03	0.212**	0.07	0.023**	0.25	0.235**

Plaque index after the observational period of group C was the best with a mean of 0.50, followed by group B (0.58) and then Group A (0.85). With regards to plaque index, group C performed the best and was statically significant.

Gingival Index before the treatment was 0.59, 0.64, 0.78 of group A, Group b, and Group C respectively.

Best improvement was shown in group C followed by group B and group A. Intragroup comparison of plaque index showed a significant improvement in all the groups. However there was a highly significan improvement in group C.

Plaque Index before the treatment was 0.1.18, 1.11, 0.90 of group A, Group b, and Group C respectively. Best improvement was shown in group C followed by group B and group A. Intragroup comparison of gingival index showed a Non-significant improvement in all the groups.

DISCUSSION

Plaque is a bacterial biofilm which forms on the surface of the teeth. It is collection of compound bacterial inhabitants which are systematized in intercellular matrixial polymers of saliva and bacterial origin [3]. The orthodontic works has established that orthodontic handling is always associated with microbial colonization of the gingival and dental tissues[9,10] as it creates an environment which favors qualitative and quantitative changes to dental plaque[11–13].

Patients wearing fixed orthodontic appliances should therefore take drastic hygiene measures, although this is difficult to obtain particularly from children and teenagers[14]. Mechanical and chemical control of dental plaque is the key to preventing periodontal diseases.[15] Improper oral hygiene leads to accumulation of plaque and often leads to gingival enlargement.

In this study, the main aim was to compare the effect of using an electric toothbrush as opposed to a manual toothbrush combined with a chlorhexidine-based mouth-rinse in order to control oral hygiene in orthodontically treated patients.

The comparison was conducted by assessing PI and GI. To this end, a group of patients using manual toothbrushing alone served as control. Patients were distributed randomly into three groups and received instructions regarding toothbrushing using a demonstration model. Furthermore, no professional toothbrushing was performed at the chair on our patients throughout the study, the aim being to test the different plaque control techniques in the everyday conditions encountered by all patients receiving orthodontic treatment.

To limit bias in PI and GI measurement, calculations were done by a single examiner who had been previously trained to conduct the calibration sessions before initiation of the study.[16–18] Patients presenting periodontitis or severe gingival inflammation, a physical or mental handicap, a systemic disease, removable appliances or prostheses, periodontal pockets greater or equal to 4 mm, gingival recession superior or equal to 2 mm and those with fewer than five teeth per quadrant were excluded from the study, as were smokers and heavy drinkers, patients having commenced antibiotic treatment and those who had used a mouth-rinse within the 2 months preceding the study.

CONCLUSION

In view of the results obtained, patients receiving multi attachment orthodontic treatment are invited to use mouthrinses over short periods in addition to brushing their teeth with a manual toothbrush or, alternatively, to use an electric toothbrush.

CONFLICTS OF INTEREST

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

REFERENCES

1. Spalding PM, Cohen BD. Orthodontic adjunctive treatment in fixed prosthodontics. *Dent Clin North Am*. 1992;36(3):607-629.

2. Gorbunkova A, Pagni G, Brizhak A, Farronato G, Rasperini G. Impact of Orthodontic Treatment on Periodontal Tissues: A Narrative Review of Multidisciplinary Literature. *Int J Dent*. 2016;2016. doi:10.1155/2016/4723589

3. Nithya S, Saxena S, Kharbanda J. Microbial biofilms—Development, behaviour and therapeutic significance in oral health. *J Dr NTR Univ Health Sci*. 2020;9(2):74. doi:10.4103/JDRNTRUHS.JDRNTRUHS_5_20

4. Marsh PD. Dental plaque as a biofilm and a microbial community – implications for health and disease. *BMC Oral Health*. 2006;6(Suppl 1):S14. doi:10.1186/1472-6831-6-S1-S14

5. Beachey EH, Giampapa CS, Abraham SN. Bacterial adherence. Adhesin receptor-mediated attachment

of pathogenic bacteria to mucosal surfaces. *Am Rev Respir Dis*. 1988;138(6 Pt 2):S45-48. doi:10.1164/ajrccm/138.6_Pt_2.S45

6. Gorbunkova A, Pagni G, Brizhak A, Farronato G, Rasperini G. Impact of Orthodontic Treatment on Periodontal Tissues: A Narrative Review of Multidisciplinary Literature. *Int J Dent*. 2016;2016. doi:10.1155/2016/4723589

7. Reichardt E, Geraci J, Sachse S, et al. Qualitative and quantitative changes in the oral bacterial flora occur shortly after implementation of fixed orthodontic appliances. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 2019;156(6):735-744. doi:10.1016/j.ajodo.2018.12.018

8. Srivastava K, Tikku T, Khanna R, Sachan K. Risk factors and management of white spot lesions in orthodontics. *J Orthod Sci*. 2013;2(2):43-49. doi:10.4103/2278-0203.115081

9. Paolantonio M, di Girolamo G, Pedrazzoli V, et al. Occurrence of Actinobacillus actinomycetemcomitans in patients wearing orthodontic appliances. A cross-sectional study. *J Clin Periodontol*. 1996;23(2):112-118. doi:10.1111/j.1600-051x.1996.tb00543.x

10. Chan FKL, Lanas A, Scheiman J, Berger MF, Nguyen H, Goldstein JL. Celecoxib versus omeprazole and diclofenac in patients with osteoarthritis and rheumatoid arthritis (CONDOR): a randomised trial. *Lancet Lond Engl*. 2010;376(9736):173-179. doi:10.1016/S0140-6736(10)60673-3

11. Huber SJ, Vernino AR, Nanda RS. Professional prophylaxis and its effect on the periodontium of full-banded orthodontic patients. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 1987;91(4):321-327. doi:10.1016/0889-5406(87)90174-0

12. Friedman MT, Barber PM, Mordan NJ, Newman HN. The "Plaque-Free Zone" in Health and Disease: A Scanning Electron Microscope Study. *J Periodontol*. 1992;63(11):890-896. doi:10.1902/jop.1992.63.11.890

13. Olympio KPK, Bardal P a. P, de M Bastos JR, Buzalaf M a. R. Effectiveness of a chlorhexidine dentifrice in orthodontic patients: a randomized-controlled trial. *J Clin Periodontol*. 2006;33(6):421-426. doi:10.1111/j.1600-051X.2006.00927.x

14. Yeung SC, Howell S, Fahey P. Oral hygiene program for orthodontic patients. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 1989;96(3):208-213. doi:10.1016/0889-5406(89)90457-5

15. Suomi JD. Prevention and control of periodontal disease. *J Am Dent Assoc 1939*. 1971;83(6):1271-1287. doi:10.14219/jada.archive.1971.0471

16. Hannah JJ, Johnson JD, Kuftinec MM. Long-term clinical evaluation of toothpaste and oral rinse containing sanguinaria extract in controlling plaque, gingival inflammation, and sulcular bleeding during orthodontic treatment. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 1989;96(3):199-207. doi:10.1016/0889-5406(89)90456-3

17. Dombret B, Matthijs S, Sabzevar MM. Interexaminer reproducibility of ordinal and interval-scaled plaque indices. *J Clin Periodontol*. 2003;30(7):630-635. doi:10.1034/j.1600-051x.2003.00281.x

18. Haffajee AD, Thompson M, Torresyap G, Guerrero D, Socransky SS. Efficacy of manual and powered toothbrushes (I). Effect on clinical parameters. *J Clin Periodontol*. 2001;28(10):937-946. doi:10.1034/j.1600-051x.2001.028010937.x