Assessment of oral hygiene in a sample of orthodontically treated patients using different bracket materials with different motivational techniques in Sulaimani City

Sulaimani Dental Journal

*Aras M. Rauf, Tara A. Rashid, Ara O. Fatah, Fadil A. Kareem and Nyaz O. Mohammad**

Abstract

Background: Orthodontic treatment with fixed appliances alters the oral environment because oral cleaning becomes more difficult with the presence of orthodontic appliance and its components. Numerous studies in the literature have evaluated the oral hygiene motivational methods in orthodontic patients.

Objectives: To compare the effectiveness of three different motivational techniques for maintaining good oral hygiene during the long term fixed orthodontic treatment.

Materials and methods: This comparative study was carried in Sulaimani city, on 60 patients with their age ranged from 12-18 years having fixed orthodontic appliances for a period of 18± 6 months were selected and divided randomly according to motivational techniques into three study groups (A, B and C), each group was subsequently subdivided into 2 subgroups according to the type of bracket material. The sample was subjected over a period of 6 months to different motivational techniques during the orthodontic treatment. Oral health status was examined and recorded twice using simplified oral hygiene index (OHI-S). The results were statistically analyzed with Statistical Product and Service Solutions software (SPSS, V16).

Results: After motivation and reinforcement, improvement of oral health was observed among the patients. Visual evidence motivational technique (applied for group C) approved to be the most significant effective motivational technique ($P \leq 0.001$) for patients undergoing orthodontic treatment regardless the type of the bracket material.

Conclusions: Orthodontists should concern about the motivation of the patients undergoing orthodontic treatment keeping sustained oral hygiene throughout the treatment period. This study confirmed that visual evidence motivational technique is the best educational and motivational technique for orthodontic patients that should be carried out before and throughout the treatment.

Keywords: *Oral health status, motivational technique, orthodontic treatment.*
Received: October 2013, Accepted: January 2014

Introduction

Orthodontic treatment with fixed appliances alters the oral environment, increases plaque amount, [1] changes the composition of the flora [2] and complicates cleaning for the patient [3] Gingivitis and enamel decalcification [4,5] around fixed appliances are frequent side effects when the preventive programs have not been implemented. The use of a fixed orthodontic appliance based on brackets and archwires gives rise to retention niches that pose an increased risk of caries [6,7,8]. Enamel demineralization around the brackets is one adverse side effect that is of major clinical relevance [9-12]. Clinical studies have indicated that orthodontic treatment may also be associated with deterioration in periodontal health [13-15]. However, the majority of studies have concluded that overall gingival alterations are transient with no permanent damage to periodontal supporting tissues [16-19].

One of the major and most common challenges in prevention strategies within the field of oral health is the control of plaque and, consequently, the control of dental caries and gingival inflammation [20-22]. Mechanical methods such as the use of toothbrush and dental floss, when applied effectively, can promote proper plaque control [23,24]. Dental plaque should be monitored before setting up the appliance and if patients are motivated during the course of treatment, one can prevent the gingival index from rising [25]. It seems to be that oral instructions alone, at the orthodontist's office, would not be sufficient when a high level of oral hygiene is required during orthodontic treatment. Other methods for patients' motivation should be taken into consideration [26]. Mechanical methods of plaque removal require time, motivation and manual skill [27]. Up to our knowledge, no previous studies investigated the efficiency of various oral hygiene motivational

*Department of Pedodontics, Orthodontics, and Preventive Dentistry. School of Dentistry/ University of Sulaimani.
Corresponding author: aras.rauf@univsul.net

techniques in our locality applied by the orthodontists. The objective of this study was to evaluate the efficacy of different motivational techniques considering the type of bracket material.

Methods

Ethical committee of the faculty of medical sciences/ University of Sulaimani reviewed and approved the protocol of the study; consent forms of participation was signed by sixty orthodontic patients (males and females) attending a private orthodontic clinic who agreed to take part in the study for a period of six months at least; inclusion criteria were set as follows: A patient free from systemic diseases and orthognathic surgery, no previous orthodontic treatment with neither fixed nor removable appliance and no extra-oral orthodontic attachments. The patients were divided randomly into 3 equal groups (A, B, and C) according to the motivational technique to be given. Each group was in turn subdivided into 2 equal subgroups according to the bracket material (stainless steel and tooth-colored plastic brackets). As a matter of standardization, all the patients were trained on horizontal scrubbing technique of tooth brushing and instructed to use oral-B orthodontic brush with V-shaped bristles to remove plaque from brackets and teeth. All the patients were examined by a trained orthodontist and oral hygiene status was evaluated twice, before and after the motivational course. In addition to the information regarding the oral healthcare practice and behavior; oral health status was examined using simplified oral hygiene index (OHI-S) which was modified by Greene (1967) that is adopted by the world health organization (WHO) for such epidemiological studies [(28)]. Each group was subjected to a different motivational technique as follows:

Group A: Classical motivational technique: Patients were motivated through conventional plaque control measures which means the plaque disclosed with 2% mercurochrome. The composition of plaque, its effects on oral health, and the importance of its removal were stressed, and a horizontal scrubbing technique of brushing was demonstrated to the patients.

Group B: chair-side motivational technique: In this method an indicator dye, Bromocresol green, was demonstrated to change color from green to yellow on addition of a drop of 0.1NHCl acid in the depression of a color plate. This step was carried out to show the patient that the change in color of the dye is due to a drop in pH because of the addition of acid. A pooled plaque sample from the patient was then put into another depression of the color plate containing 1 drop of indicator dye which did not show any evident color change. This was followed by 10% glucose rinse for 1 minute by the individual. After 8–10 minutes, pooled plaque was taken from the patient's mouth and put into another depression of the color plate. A drop of bromocresol green dye was added to the collected plaque. On addition of the dye, a color change occurred from green to yellow, and the pH dropped after a glucose rinse, depicting the acidic nature of dental plaque. In order to motivate the patients to regularly remove dental plaque, the effect of sweet foods on the production of weak acids in dental plaque by microorganisms was described to the patients. These weak acids initiate demineralization of enamel leading to cavity formation and other by-products of dental plaque bacteria that irritate gingival tissue to produce gingivitis. In addition, as in group A, conventional plaque control measures were also demonstrated to the patients.

Group C: visual evidence motivational technique. For this group of the patients, a

Table 1. Characteristics of the study sample

Variables	Descriptive statistics			
		No.		Total
Number of patients	males	30		60
	females	30		
Bracket type	metal	36		60
	plastic	24		
Frequency of tooth brushing	Once a day	38	63.3%	
	Twice a day	18	30%	60
	No regular brushing	4	6.7%	
Reason behind treatment	cosmetic	51	85%	60
	functional	9	15%	

prerecorded video of the plaque bacteria was shown to the patients. This was followed by plaque disclosure with 2% mercurochrome and demonstration of a horizontal scrubbing method of brushing as done in the former groups.

Clinical examination

Each patient was seated on a dental chair in an upright position under light illumination with the head tilted slightly backward and supported against the headrest of the dental chair in such a manner that the mandibular plane be parallel to the floor while the patient opens his/her mouth. Clinical examination started first from upper left posterior side, forward to the upper right side, down to the lower right side then passing through the lower anterior region to the lower left side. The preselected tooth surfaces were examined for the presence and extension of debris and/or calculus for scoring, by moving the WHO probe across the surfaces and gingival margins, reflecting the cheeks and lips with a disposable mirror. All the scores were recorded in a specially designed case-sheet for this purpose. The data were analyzed with SPSS (V.16) software to declare the results and to test the hypothesis with the degree of confidence set for less than 0.05.

Results

The initial descriptive statistics showed that 63.3% of the sample (13 males & 25 females) was brushing their teeth once a day, 30% of them (7 males & 11 females) twice a day, while the other 6.7% (2 males & 2 females) were declared to have no regular tooth brushing routine. The majority of the patients (85%) reported that the reason behind the orthodontic therapy is cosmetics, and the rest (15%) were suffering from functional and esthetic problems as shown in table 1. At the beginning of the study, the oral hygiene of the patients was noticeably deteriorated table 2. The result of paired t-test showed that there was a highly significant difference in the oral health status between pre and post-motivational action with the p value presented to be less than 0.001 table 3.

Data analysis for independent factors (gender, type of the bracket and age of the patient) clarified that the only factor that significantly correlated with improvement of oral health and lowered the oral hygiene simplified index after implementation of the educational program is the type of motivational technique tables 4 and 5.

Discussion

In fixed orthodontic treatment, plaque retention surfaces are increased and, as a result, most patients are confronted with hygiene difficulties, which eventually cause elevated plaque indices [29]. Frequent patient visits for orthodontic maintenance are opportunities for the dentist to teach techniques that promote oral hygiene, and to reinforce instructions that encourage healthy habits [30]. In order to promote and maintain satisfactory oral health, orthodontic patients should undergo a stringent program of oral hygiene and dental plaque control before and during orthodontic treatment [31,32]. Feliu [30] demonstrated that patients undergoing orthodontic treatment may have lower levels of plaque and gingival inflammation than patients who are not under orthodontic treatment provided that they first attend an educational preventive program. Silva et al [33] showed that one group of orthodontic patients who received oral hygiene instructions only on the first day of treatment did not change their habits while the other group, who was given instructions every fortnight throughout the period with hygiene classes and motivation

Table 2. Descriptive analysis of pre and post motivation OHI-S

OHI-S	No.	Minimum Value	Maximum value	Mean value	SD
Premotivation index	60	1.3	4.1	2.881	0.69
Postmotivation index	60	0.09	3.8	1.495	0.975

Table 3. Paired mean differences between pre and post motivation OHI-S

OHI-S	Paired Differences			T	df	p- value
	Mean	SD	SE			
Pre-index – post-index	1.386	0.9802	0.1265	10.951	59	0

Table 4. Pre-post index correlation regarding gender, age, bracket type, and motivational technique.

		Pre-index	gender	age	Bracket type	Motivational technique
Post-index	Pearson Correlation	0.3	-0.024	0.089	-0.0799	-0.7705
	Sig. (2-tailed)	0.006	0.85	0.496	0.5437	0
	N	60	60	60	60	60

Table 4. Multiple regression analysis of the post OHI-S as a dependent variable and several co-variants.

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Gender	-0.0989	0.165	-0.05087	-0.5988	0.551
Age	0.0276	0.047	0.0497	0.5851	0.56
Bracket-type	-0.1504	0.163	-0.07775	-0.9176	0.362
Motivation	-0.9127	0.1005	-0.77033	-9.0772	0

and were monitored with a plaque control chart, achieved a better oral hygiene index. The current health paradigm requires that patients be regarded as one single whole. Health promotion and disease prevention should be part of the philosophy adopted by orthodontists in caring for their patients. Furthermore, professionals should provide guidance and motivation to their patients regarding oral health care before and during orthodontic treatment [34].

Methods of educating orthodontic patients are generally classified as verbal, [35-37] written, [38] or visual based (videotapes) [39]. In this study, all patients received oral hygiene education before treatment and the information were reinforced throughout the period of the study. As expected, the three types of the educational methods applied in this study had impact on improving oral health of the participating patients; however, group C with visual evidence education seen to be the most effective approach for lowering the Oral hygiene index; the reason behind this difference might be contributed to the fact that, using more than one educational aid to provide instruction and reinforcement leads to retention and retrieval of the information. Boyd [37] evaluated the effectiveness of the self-monitoring plaque control. Huber [40] investigated the efficiency of repeated professional prophylaxis together with reinforced oral hygiene instruction on a monthly basis and found that the monthly professional prophylaxis had a significant effect in reducing the gingival enlargement routinely associated with fixed orthodontic appliances. Yeung [41] conducted an oral hygiene program consisting of four weekly sessions of oral health education and instruction of plaque control techniques. McGlynn [38] studied the effectiveness of an oral hygiene booklet and repeated lectures with professional prophylaxis. No significant differences between the booklet and lecture groups were found. On the other hand, Lees et al [30] found no significant differences between the written, verbal, and videotape instruction methods.

Conclusion

This study confirmed that visual evidence motivational technique is the best educational and motivational technique for orthodontic patients that should be carried out before and throughout the treatment. We hypothesize that solely verbal recommendations are not enough to achieve optimum plaque removal, and that the ameliorations of the patients' inaccurate oral hygiene efforts by the specialists at the same session are essential.

References

1. Pender N. Aspects of oral health in orthodontic patients. Br J Orthod. 1986:13:95–103.
2. Lundstro¨m F, Krasse B. Streptococcus mutans and lactoba- cilli frequency in orthodontic patients; the effects of chlorhexidine treatment. Eur J Orthod. 1987:9:109–16.
3. Olympio KPK, Bardal PAP, de M Bastos JR, Buzalaf MAR. Effectiveness of a chlorhexidine dentrifrice in orthodontic patients: a randomized-controlled trial. J Clin Periodontol. 2006:33:421–26.
4. Arends J, Christofferson I. The nature of early caries lesions in enamel. J Dent Res. 1986:65:2–11.
5. O'Reilly MM, Featherstone JD. Demineralization and remineralization around orthodontic appliances: an in vivo study. Am J Orthod Dentofacial Orthop. 1987:92:33–40.
6. Årtun J, Brobakken BO. Prevalence of carious white spots after ortho dontic treatment with multibonded appliances. Eur J Orthod 1986:8:229–34.
7. Årtun J, Thylstrup A. A 3-year clinical and SEM study of surface changes of carious enamel lesions after inactivation. Am J Orthod Dentofacial Orthop.1989:95:327–33.
8. Mizrahi E. Enamel demineralization following orthodontic treatment. Am J Orthod 1982:82:62–7.
9. Gorelick L, Geiger AM, Gwinnett AJ. Incidence of white spot formation after bonding and banding. Am J Orthod 1982:81:93–8
10. Mitchell L. Decalcification during orthodontic treatment with fixed appliances - an overview. Br J Orthod. 1992:19:199–205.
11. Ogaard B. Prevalence of white spot lesions in 19-year-olds: a study on untreated and orthodontically treated persons 5 years after treatment. Am J Orthod Dentofacial Orthop. 1989:96:4237.
12. Pancherz H, Mühlich DP. Entwicklung von Karies bei kieferorthopä discher Behandlung mit festsitzenden Apparaturen - Ein Vergleich von Zähnen mit und ohne Kariesvorschädigungen. Kieferorthop. 1997:11:139–44.
13. Zachriss BU, Alnaes L: Periodontal condition in orthodontically treated and untreated individuals 1. Loss of attachment, gingival pocket depth and clinical crown height. Angle Orthodontist 1973: 43:402–11.
14. Zachriss BU, Alnaes L: Periodontal condition in orthodontically treated and untreated individuals 2. Alveolar bone loss - radiographic findings.Angle Orthodontist. 1974:44:48–55.
15. Alexander SA: Effects of orthodontic attachments on the gingival health of permanent second molars. Am J Orthod Dentofacial Orthop. 1991:100:337–40.
16. Gomes SC, Varela CC, da Veiga SL, Rosing CK, Oppermann RV: Periodontal conditions in subjects following orthodontic therapy. A preliminary study. Eur J Orthod. 2007:29:477–81.
17. Kloehn JS, Pfeifer JS: The effect of orthodontic treatment on the periodontium. Angle Orthod 1974: 44:127–34.
18. Kouraki E, Bissada NF, Palomo JM, Ficara AJ: Gingival enlargement and resolution during and after orthodontic treatment. N Y State Dent. J 2005:71:34–7.
19. Sadowsky C, Begole EA: Long-term effects of orthodontic treatment of periodontal health. Am J Orthod Dentofac Orthop. 1981: 80:156–72.
20. Carvalho LEP, Granjeiro JM, Bastos JRM, Henriques JFC, Tarzia O. Clorexidina em Odontologia. Rev Gaúcha Odontol. 1991:39:423-7.
21. Sekino S, Ramberg P, Uzel NG, Socransky S, Lindhe J. Effect os various chlorhexidine regimens on salivary bacteria and de novo plaque formation. J Clin Periodontol. 2003:30:919-25.
22. Sreenivasan PK, Tambs G, Gittins E, Nabi N, Gaffar A. A rapid procedure to ascertain the antimicrobial effcacy of oral c a r e formulations. Oral Microbiol Immuol. 2003: 18:371-8.
23. Owens J, Addy M, Faulkner J, Lockwood C, Adair R. A short- term clinical study design to investigate the chemical plaque inhibitory properties of mouthrinses when used as adjunct to toothpastes: applied to chlorhexidine. J Clin Periodontol. 1887:24:732-7.
24. Torres MCM. Utilização da clorexidina em seus diversos veículos. Rev Bras Odontol. 2000:57:174-80.
25. Boyd RL. Enhancing the value of orthodontic treatment: incorporating effective preventive dentistry into treatment. Am J Orthod Dentofacial Orthop. 2000:117:601-3.
26. Dannan. Evaluation of Oral Hygiene Instructions' Awareness during Orthodontic Treatment among Syrian Orthodontists; [Internet Scientific Publications, LLC].
27. Depaola IG. Chemotherapeutic inhibition of supragingival dental plaque and gingivitis development. J Clin Periodontol. 1989:16:311-5.
28. Greene JC. The Oral Hygiene Index—Development and uses. Journal of Periodontology. 1967:38:37.
29. Heintze SD. Aproflaxia individual em pacientes com aparelhos fixos: recomendações para consultório Ortodontia. 1996:29:4-15.
30. FeliuJL. Long-term benefits of orthodontic treatment on oral hygiene. Am J Orthod Dentofacial Orthop. 1982:82:473-7.
31. Bastos JRM, Henriques JFC, Olympio KPK. Prevenção de carie e doença periodontal em pacientes sob tratamento ortodôntico. Manual didático. Bauru: Universidade de São Paulo: 2001.
32. Uetanabaro T, Martins JES, Andrade JLF. Acúmulo de placa bacteriana em pacientes portadores de colagem direta e anéis convencionais. Rev Gaúcha Odontol. 1984:32:161-6.
33. Silva Filho OG, Corrêa AM, Terada HH, Nary Filho H, Caetano MK. Programa supervisionado

de motivação e instrução de hygiene e fsioterapia bucal em crianças com aparelhos ortodônticos. Rev Odontol Univ São Paulo. 1990:4:11-9.

34. *Priscil B; Kelly Polido O; Jose B; Jose H; Marília B. Education and motivation in oral health preventing disease and promoting health in patients undergoing orthodontic treatment Dental Press J. Orthod. 2011 vol.16 (3).*
35. *Huber SJ, Vernino AR, Nanda RS. Professional prophylaxis and its effect on the periodontium of full-banded orthodontic patients. Angle Orthod. 1972:42:26–34.*
36. *Yeung SC, Howell S, Fahey P. Oral hygiene program for orthodontic patients. Am J Orthod Dentofacial Orthop. 1989:96:208–13.*
37. *Boyd RL. Longitudinal evaluation of a system for self-monitoring plaque control effectiveness in orthodontic patients. J Clin Periodontol. 1983:10:380–88.*
38. *McGlynn FD, Le Compte EJ, Thomas RG, Courts FJ, Melamed BG. Effect of behavioral self-management on oral hygiene adherence among orthodontic patients. Am J Orthod. 1987:91:321–27.*
39. *Lees A, Rock WP. A comparison between written, verbal, and videotape oral hygiene instruction for patients with fixed appliances. J Orthod. 2000:27:323–28.*
40. *Huber SJ, Vernino AR, Nanda RS. Professional prophylaxis and its effect on the periodontium of full-banded orthodontic patients. Angle Orthod. 1972:42:26–34.*
41. *Yeung SC, Howell S, Fahey P. Oral hygiene program for orthodontic patients. Am J Orthod Dentofacial Orthop. 1989:96:208–13.*