Sabit ortodontik tedavi gören adölesanlarda tekrarlı oral hijyen motivasyon yöntemlerinin plak ve inflamasyon belirteçlerine etkisi

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Abstract

The effects of the repetitive and reinforced oral hygiene motivation methods on plaque and inflammation markers of adolescents with fixed appliances

Objective: High standard of oral hygiene is essential for patients undergoing fixed orthodontic treatment. The aim of this study is to investigate whether the repetitive and reinforced oral hygiene motivation methods (OHMM) will result in lower plaque index (PI), gingival index (GI) and bleeding on probing (BOP) scores in adolescents with fixed orthodontic appliances. **Method:** The study group, composed of 90 patients, was divided into three groups; Group I: Only verbal information (n=30), Group II: Verbal information with demonstration on model and self application by the patient under supervision (n=30), Group III: Verbal information using the illustration catalogue and self application by the patient under supervision (n=30). The periodontal parameters (PI, GI and BOP) were recorded at the baseline, first and fourth week after. The patients received the same OHMM repetitively on the first and fourth weeks. **Results:** All of the groups have shown significant decreases in parameters when compared to the baseline values at the fourth week (P<0.05). The GI, PI and BOP values were significantly lower in Group III than the other groups (P<0.05) at the fourth week. **Discussion:** We suggest that the repetitive and reinforced OHMM in this study with the application under the supervision of the dentists/orthodontists can be realized easily in adolescents. These OHMM should be applied with tool(s) and equipment(s) which is (are) familiar to the adolescents and other target groups.

Key words: Oral hygiene; Orthodontics; Plaque control; Adolescent

Özet

Amaç: Sabit ortodontik tedavi gören hastalarda oral hijyen girişimlerinin yüksek standartta olması vazgeçilmezdir. Bu çalışmanın amacı, tekrarlı oral hijyen motivasyon (OHM) yöntemlerinin sabit ortodontik tedavi gören adölesanlarda plak indeksi (Pİ), gingival indeks (Gİ) ve sondlamada kanama (SK) skorlarında azalmayla sonuçlanıp sonuçlanmadığının araştırılmasıdır. **Yöntem:** Çalışma grubu 90 kişiden oluşmaktaydı ve üç alt gruba ayrıldı: Grup I: yalnız sözel bilgilendirme (n=30), Grup II: Model üzerinde OHM yönteminin demonstrasyonu ve hastaya gözetim altında uygulatılması (n=30), Grup III: Katalog üzerinde bilgilendirme ve hastaya gözetim altında uygulatılması (n=30). Periodontal parametreler (Pİ, Gİ ve SK) başlangıç, motivasyon sonrası 1. ve 4. haftalarda kaydedilmiş ve OHM yöntemleri bu seanslarda kaydedildi ve tekrarlandı. **Sonuçlar:** Dördüncü hafta bulguları başlangıç ile karşılaştırıldığında tüm gruplarda tüm parametrelerde anlamlı düşüş bulundu (P<0.05). Ayrıca 4. haftada Grup III' te Pİ, Gİ ve SK değerlerinde diğer gruplardan anlamlı düzeyde fazla bir azalma belirlendi (P<0.05). **Tartışma:** Bu çalışmanın bulgularına gore hekim gözetiminde öğretilen tekrarlı OHM yöntemlerinin adölesanlarda uygun bir yaklaşım olduğu ileri sürülebilir.

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Uygulamaların adölesanın veya başka bir topluluk hedef alınıyorsa bu grubun genellikle kullandığı, tanıdığı veya başka bir deyişle aşina olduğu gereçlerle yapılması gereklidir.

Anahtar Sözcükler: Oral hijyen; Ortodonti; plak kontrolü, adölesan

Introduction

It is known and accepted fact that a high standard of oral hygiene is essential for patients undergoing fixed orthodontic treatment (1-4). This fact led the orthodontists to monitor the effectiveness of the patient's present oral hygiene habit and to motivate the patient to apply the most appropriate plaque elimination method. In literature, numerous studies investigated the plaque elimination methods for orthodontic patients. Some of these studies evaluated the efficiency of toothpastes and mouthwashes (5-8), and oral irrigators (9, 10). Others compared the effectiveness of manual or electric toothbrushes on plaque elimination (1-4). Hobson and Clark (11), stated that tooth brushing, the oldest and most effective method, remains the mainstay of plaque control. Few studies evaluated the effectiveness of various oral hygiene motivation methods (OHMM). These methods are generally classified as verbal (12-14), written (15), or visual based (16). In a previous study (17) we hypothesized that solely verbal recommendations were not enough to achieve optimum plaque removal, and the ameliorations of the patients' inaccurate oral hygiene efforts by the specialists at the same session is essential. The results of this study revealed that OHMM (visual information and self application by the patient under the supervision of dentists/orthodontists) seemed to be more successful in decreasing the plaque index (PI, 18), gingival index (GI, 19), and bleeding on probing (BOP, 20). The repetition and reinforcement are essential to obtain the behavioral changes achieved by the OHMM in the long term (21-24). Not only with children and adolescents, the studies conducted with the older patients using removable partial dentures revealed that the patients need to be checked, remotivated and reinstructed frequently to improve the plaque scores (25). From another point, the adolescence is a complicated and hard life time for most of the "youngsters" and the reinforcement supported with positive feedbacks are important to gain persons with self-confidence, open to development and innovation and healthy with all aspects for the public health. When the orthodontic health and periodontal health are related issues, it is obvious that a particular approach for the adolescents should be developed in terms of OHMM. In our previous study (17) we have determined the most appropriate OHMM in a group of adolescents. In the current study we aim to investigate whether repetitively reinforced OHMM is more effective in reducing the plaque and inflammatory markers.

Subjects and Methods

The present study was conducted in accordance with the EEC Guidelines for Good Clinical Practice, and with ethical standards laid down in Version VI (2002) of the Declaration of Helsinki. The nature of the study was explained in detail to parents of each patient and an informed consent was obtained from the parents. After the proposed study was approved by the appropriate institutional review board, a total of 90 orthodontic patients (48 female and 42 male, age range 15-17, mean age: 15.18±0.1) undergoing fixed orthodontic treatment (<1 year) were included in this study (scheduled between the May 2007-July 2007).

The study group was randomly divided into three groups:

Group I: Only verbal information (V),

Group II: Verbal information with demonstration on model with fixed appliances and self application by the patient (M+A)

under the supervision of the clinician and corrections made if necessary,

Table 1. The periodontal parameter values of and comparisons among the OHMM groups

Parameters		**Groups**		***P*** (Mann Whitney U test)
GI	**Group I (V)**	**Group II (M+A)**	**Group III (I+A)**	
Baseline	0.59±0.60	0.67±0.66	0.69±0.69	P>0.05
First week	0.47±0.12	0.25±0.24	0.15±0.12	†, ***‡, ** ¶, ***
Fourth week	0.35±0.34	0.15±0.12	0.08±0.10	†, ***‡, *** ¶, ***
P (Friedman test)	***	***	***	
PI	**Group I (V)**	**Group II (M+A)**	**Group III (I+A)**	
Baseline	1.82±1.80	1.86±1.82	1.81±1.79	P>0.05
First week	1.31±1.24	1.08±1.05	0.64±0.56	†, P>0.05 ‡, ***¶, ***
Fourth week	1.12±1.10	0.61±0.51	0.27±0.21	†, ***‡, *** ¶, ***
P (Friedman test)	***	***	***	
BOP (%)	**Group I (V)**	**Group II (M+A)**	**Group III (I+A)**	
Baseline	63.89±65.38	69.09±66.08	75.82±74.11	P>0.05
First week	52.57±51.75	44.28±41.54	43.01±40.67	†, *** ‡ P>0.05 ¶, **
Fourth week	36.68±34.99	31.25±31.25	21.21±20.65	†, *‡, *** ¶, ***
P (Friedman test)	***	***	***	

GI: Gingival index, PI: plaque index, BOP: bleeding on probing, † The comparison between the Group I and Group II, ‡ The comparison between the Group II and Group III, ¶ The comparison between the Group I and Group III, (Mann Whitney U test), *P<0.05, ** P<0.01, ***P<0.001, ***P<0.0001.

Group III: Verbal information using the illustration catalogue1 and self application by the patient (I+A) under the supervision of the clinician and corrections made if necessary.

In the previous study (17), there were two groups additionally: Group M had received OHMM verbally demonstrated by the dentist using a demonstration model with brackets and Group I had received OHMM verbally by dentists using the illustration catalogue. The parameters; PI (18), GI (19) and BOP (20) were recorded by a skilled clinician (YÖ) at baseline, one and four weeks later. Different than our previous study (17), the patients received the same OHMM repeatedly at the first and fourth weeks after baseline. The same type of orthodontic toothbrushes (Oral B®, Procter & Gamble, Cincinnati, USA), interdental brushes (Oral B®, Procter & Gamble, Cincinnati, USA), and toothpastes (Colgate-Palmolive, Brazil) were provided. Parents were not allowed to accompany the patients during the instruction sessions.

Statistical method

The presence of significant differences between the OHMM groups at baseline, first and fourth week were determined with the Friedman's test. Wilcoxon signed ranks test was used to determine the group pairs. The comparisons between the groups were evaluated using the Mann Whitney U test. The data were presented as mean ± standard deviation. In addition to these analyses, the data (the differences between the baseline and 4th week) from the previous (17) and the present study were compared using the paired samples t test. All statistical analyses were carried out using the SPSS 11.0 (SPSS Inc, Chicago, IL), with a 2-tailed P value of 0.05 used as a threshold for significance.

Results

All of the 90 patients cooperated with the study procedures. At the baseline, no significant differences were observed between the OHMM groups in PI, GI and BOP values (P>0.05, Table1).

First week results

All of the parameters showed significant decreases in all groups (P<0.01, Table 1). The GI and PI values decreased in all groups compared to the baseline. The lowest GI and PI values belong to the Group III (P<0.05, Table 1). The BOP percentages decreased in all groups compared to the baseline values; however at the first week no significant differences between Group II and Group III observed (P>0.05, Table 1).

Fourth week results

All of the parameters decreased significantly compared to the baseline (P<0.05, Table 1). The differences among the groups found statistically significant for all of the parameters, and the lowest GI, PI and BOP values were observed in Group III (P<0.05, Table 1).

The comparison between the previous and present study

The differences in the parameters between the baseline and 4th week were compared between the previous (17) and present studies. This comparison has revealed that GI, PI and BOP values decreased significantly more in the present than the previous study at the fourth week in Group II (P>0.05, Table 2). However, the differences in the GI, PI and BOP values were not significantly different between the previous and present studies in Group III (P>0.05, Table 2).

Discussion

Since orthodontic treatment with fixed appliances alters the oral environment, increases plaque amount (26), changes the composition of the flora (27) results in gingivitis and enamel decalcification (28, 29). It is essential to develop an oral hygiene program in these patients. Mechanical methods of plaque removal require time, motivation and manual dexterity. This fact makes it difficult to effectively educate, and train in orthodontic patients. The presence of brackets, elastics and other parts of fixed appliances requires higher attention in oral hygiene applications in

Table 2. The comparison between the results of the previous and present study (mean ± standard deviation)

Groups/parameters	ΔGI (previous study)	ΔGI (present study)	*P*	ΔPI (previous study)	ΔPI (present study)	*P*	ΔBOP (%) (previous study)	Δ BOP (%) (present study)	*P*
Group I (V)	0.21 ±0.21	0.24 ± 0.19	0.633	0.36 ± 0.72	0.72 ± 0.47	***	15.59 ± 29.08	27.20 ± 18.35	***
Group II (M+A)	0.23 ± 0.15	0.53 ± 0.18	*	0.76 ± 0.36	1.25 ± 0.35	***	31.12 ± 28.89	37.84 ± 16.91	**
Group III (I+A)	0.32 ± 0.14	0.61 ± 0.14	0.083	1.19 ± 0.41	1.54 ± 0.38	0.254	52.34 ± 22.57	53.46 ± 15.70	0.822

Δ: difference of the baseline-4th week values, GI: Gingival index, PI: plaque index, BOP: bleeding on probing, Paired samples t test (*P<0.05, ** P<0.01, *** P<0.001, *** P<0.0001).

orthodontic patients. There are only few reports on the OHMM in patients with fixed orthodontic appliances, although there are an excessive number of studies have investigated the dental health education program for almost all ages. In adolescents, it was found that the various dental health education programs result in reduction of gingival bleeding (30). Similar to our study, Yeung et al. (13) conducted an oral hygiene program consisting 4 weekly sessions of oral health education. They have found significantly lower bleeding on probing, gingival index, plaque index scores in the experimental group. Huber et al. (12) 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. In our study, no professional prophylaxis was given during the study period since the effects of reinforcement of oral hygiene procedures on adolescents were investigated. The study period was set to one month to reduce the positive effect of the orthodontic therapy because in the long term studies the improvement of the plaque amount may be related to the correction of the crowding. There is a lot of teaching and learning methods, such as description, discussion, show and apply, etc. (31). In the present study the "show and apply method" was used and reinforced. This method has advantages since it is patient centered and effective in achieving the psycho-motor skills (31). In the daily clinical practice, OHMM include generally verbal instructions. However, Thomson *et al.* (32) reported that verbal instructions should always be supplemented by written or visual information. The visual information might be obtained by different tools (14, 15, 33-35). However, the devices used in these studies are indirect tools for OHMM. In the present study, we used the illustration catalogue and model. The demonstration and application processes in our study are direct instructions. Direct motivation methods are suggested to be the main motivation resource when the objective is to change the behavior (35). The motivation programs in the study of Melsen and Agerbaek (36), the effect of the motivational program on knowledge and behavior was evaluated. While the program seemed to result in a reinforcement of the already existing positive attitude, the cognitive level was only slightly improved and no change in behavior resulting in improved oral health was registered. Even when patients are adequately trained, without constant education and reinforcement, compliance appeared to be diminished significantly (37). Hugoson *et al.* (24) have stated in their studies, that constant reinforcement is necessary to maintain effective plaque control in adolescents. In our previous study (17), PI in the M+A group were not found significantly different between the baseline and first week results. In the

present study, all of the OHMM have resulted in significant decreases in PI, supporting our hypothesis recommending the reinforced OHMM. Besides, there are various studies encouraged the repetitive and reinforced instructions for improvement in oral health knowledge and effective plaque control (21, 23, 34, 36, 38). We suggest that the reinforcement of the oral hygiene technique with the application under the supervision of the orthodontists is essential. Clark (39) has pointed out the importance of the motivation and feedback of the orthodontists for an oral health program. This feedback should be offered with kindness, objectivity and respect; especially for adolescents. The verbal technique in instructing the oral hygiene procedures was found to be successful in our study sample, although the adolescents were not accompanied with their parents. Thomson *et al.* (32) stated that adolescent patients should not be given verbal information alone. On the contrary, the typical characteristics of the adolescents are their efforts given to separate from parents in terms of thought and attitude and to individualize. So, the instruction given to the adolescents without their parents might be accepted as a supporting behavior for the adolescent and might be comprehend as a comprehensive approach from the dentist/adolescent to them selves. Similar to our previous study (17), in the present study, it was found that the Group III (demonstration from illustration catalogue and application by the patient under supervision) has the lowest PI, GI and BOP values in all of the time intervals. It was interesting to find that the two dimensional tool (illustration on catalogue) has an additional improving effect than the three dimensional tool (bracket fixed model) in plaque and inflammatory markers' scores. The illustrations in the catalogue are more familiar to adolescents than the models, because of its common use for educational purposes in our country. Interestingly, the decreases in PI scores' differences were not found significantly different between the Group II and III. This might be the result of the familiarity to this educational tool. On the other hand, it might be the result of the developed three dimensional perceptions in adolescent. Indeed, the study of Arıcı *et al.* (40) conducted in orthodontic patients (age range 13-16, similar to our study), investigating the efficiency of different toothbrushes. Therefore, they have advised periodic follow-ups and repetitive reinforcement of oral hygiene instructions performed earlier than 1 month. It has been shown that without re-instruction and positive reinforcement, the novelty of the instrument and the compliance to the brushing instructions and protocol diminishes rapidly (41). Subjects need individual instructions to ensure correct use and to achieve a fast "learning curve" in effective handling of the oral hygiene instruments i.e. their toothbrush (42), the manual dexterity, ability and motivation of individual patients which is of paramount importance to oral hygiene (43).

In addition, there is tentative evidence from studies that psychological approaches to behavior management can improve oral hygiene-related behaviors (44). Thus, psychological models should be used in studies aimed to establish effective interventions for improving oral health-related behaviors (45). Social cognition models provide a useful basis for the design of such studies investigating the appropriate method to obtain optimum oral hygiene in orthodontic patients.

Conclusions

- All of the parameters have shown significant decreases at the first and fourth weeks when compared to the baseline values when the OHMM were given repetitively and reinforced to the adolescents.
- The repetition and reinforcement of OHMM has resulted in more decrease in GI and PI in application groups when compared to the groups which were not motivated repetitively and reinforced..
- The self application by adolescent on the models under supervision, and

repetitive and reinforced corrections made by the clinician can easily be realized. Besides, the recommended OHMM are inexpensive which allows their usage widely.

- Appropriate OHMM and dental health education programs taken the cognitive approaches into account for the adolescents should be developed to gain self-confident and healthy persons for the public health.

References

1. Heasman P, Wilson Z, Mac Gregor I, Kelly P. Comparative study of electric and manual toothbrushes in patients with fixed orthodontic appliances. Am J Orthod Dentofac Orthop 1998;114:45-49.

2. Clerehugh V, Williams P, Shaw WC, Worthington HV, Warren P. A practice-based randomised controlled trial of the efficacy of an electric and a manual toothbrush on gingival health in patients with fixed orthodontic appliances. J Dent 1998;26:633-639.

3. Thienpont V, Dermaut LR, Van Maele G. Comparative study of 2 electric and 2 manual toothbrushes in patients with fixed orthodontic appliances. Am J Orthod Dentofacial Orthop 2001;120:353-360.

4. Hickman J, Millett DT, Sander L, Brown E, Love J. Powered vs manual tooth brushing in fixed appliance patients: a short term randomized clinical trial. Angle Orthod 2002;72:135-140.

5. 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;33:421-426.

6. Ogaard B, Alm AA, Larsson E, Adolfsson U. A prospective, randomized clinical study on the effects of an amine fluoride/stannous fluoride toothpaste/mouthrinse on plaque, gingivitis and initial caries lesion development in orthodontic patients. Eur J Orthod 2006;28:8-12.

7. Pontier JP, Pine C, Jackson DL, DiDonato AK, Close J, Moore PA. Efficacy of a prebrushing rinse for orthodontic patients. Clin Prev Dent 1990;12:12-17.

8. Ramaglia L, Sbordone L, Ciaglia RN, Barone A, Martina R. A clinical comparison of the efficacy and efficiency of two professional prophylaxis procedures in orthodontic patients. Eur J Orthod 1999;21:423-428.

9. Burch JG, Lanese R, Ngan P. A two-month study of the effects of oral irrigation and automatic toothbrush use in an adult orthodontic population with fixed appliances. Am J Orthod Dentofacial Orthop 1994;106:121-126.

10. Attarzadeh F. Water irrigating devices for the orthodontic patient. Int J Orthod 1990;28:17-22.

11. Hobson RS, Clark JD. How UK orthodontists advise patients on oral hygiene. Br J Orthod 1998;25(1):64-6.

12. 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.

13. Yeung SC, Howell S, Fahey P. Oral hygiene program for orthodontic patients. Am J Orthod Dentofac Orthop 1989;96:208-213.

14. Boyd RL. Longitudinal evaluation of a system for self-monitoring plaque control effectiveness in orthodontic patients. J Clin Periodontol 1983;10:380-388.

15. 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;91:321-327.

16. Lees A, Rock WP. A comparison between written, verbal, and videotape oral hygiene instruction for patients with fixed appliances. J Orthod 2000;27:323-328.

17. Ay ZY, Sayin MO, Ozat Y, Goster T, Atilla AO, Bozkurt FY. Appropriate oral hygiene motivation method for patients with fixed appliances. Angle Orthod 2007;77(6):1085-1089.

18. Silness J, Löe H. Periodontal disease in pregnancy. II. Correlation between oral

hygiene and periodontal condition. Acta Odontol Scand 1964;22:121–135.
19. Löe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand 1963;21:533–551.
20. Ainamo J, Bay I. Problems and proposals for recording gingivitis and plaque. Int Dent J 1975;25:229-235.
21. Tsamtsouris A, White GE, Clark ER. The effect of instruction and supervised toothbrushing on the reduction of dental plaque in kindergarten children. ASDC J Dent Child 1979;46(3):204-9.
22. Emler BF, Windchy AM, Zaino SW, Feldman SM, Scheetz JP. The value of repetition and reinforcement in improving oral hygiene performance. J Periodontol 1980;51(4):228-34.
23. Lachapelle D, Desaulniers G, Bujold N. Dental health education for adolescents: assessing attitude and knowledge following two educational approaches. Can J Public Health 1989;80(5):339-344.
24. Hugoson A, Lundgren D, Asklöw B, Borgklint G. The effect of different dental health programmes on young adult individuals. A longitudinal evaluation of knowledge and behaviour including cost aspects. Swed Dent J 2003;27(3):115-130.
25. Ribeiro DG, Pavarina AC, Giampaolo ET, Machado AL, Jorge JH, Garcia PP. Effect of oral hygiene education and motivation on removable partial denture wearers: longitudinal study. Gerodontology 2009;26(2):150-156.
26. Pender N. Aspects of oral health in orthodontic patients. Br J Orthod 1986;13:95-103.
27. Lundström F, Krasse B. Streptococcus mutans and lactobacilli frequency in orthodontic patients; the effects of chlorhexidine treatment. Eur J Orthod 1987;9:109-116.
28. Arends J, Christofferson I. The nature of early caries lesions in enamel. J Dent Res 1986;65:2–11.
29. O'Reilly MM, Featherstone JD. Epidemiol 1981;9(6):251-255.
39. Clark JR. Oral hygiene in the orthodontic practice: Motivation, responsibilities, and concepts. Am J Orthod Demineralization and remineralization around orthodontic appliances: an in vivo study. Am J Orthod Dentofacial Orthop 1987;92:33–40.
30. Redmond CA, Blinkhorn FA, Kay EJ, Davies RM, Worthington HV, Blinkhorn AS. A cluster randomized controlled trial testing the effectiveness of a school-based dental health education program for adolescents. J Public Health Dent 1999;59(1):12-17.
31. Ricks F. Principles for Structuring Cooperative Education Programs. J Coop Educ 1996;31:8-22.
32. Thomson AM, Cunningham SJ, Hunt NP. A comparison of information retention at an initial orthodontic consultation. Eur J Orthod 2001;23:169-178.
33. ter Horst G, Hoogstraten J. Immediate and delayed effects of a dental health education film on periodontal knowledge, attitudes, and reported behavior of Dutch adolescents. Community Dent Oral Epidemiol 1989;17(4):183-186.
34. Rodrigues JA, dos Santos PA, Garcia PP, Corona SA, Loffredo LC. Evaluation of motivation methods used to obtain appropriate oral hygiene levels in schoolchildren. Int J Dent Hyg 2003;1(4):227-232.
35. Rodrigues JA, dos Santos PA, Baseggio W, Corona SA, Palma-Dibb RG, Garcia PP. Oral hygiene indirect instruction and periodic reinforcements: effects on index plaque in schoolchildren. J Clin Pediatr Dent 2009;34(1):31-34.
36. Melsen B, Agerbaek N. Effect of an instructional motivation program on oral health in Danish adolescents after 1 and 2 years. Community Dent Oral Epidemiol 1980;8(2):72-78.
37. Axelsson P, Lindhe, J. Efficacy of mouthrinses in inhibiting dental plaque and gingivitis in man. J Clin Periodontol 1987;14:205–212.
38. Axelsson P, Lindhe J. Effect of oral hygiene instruction and professional toothcleaning on caries and gingivitis in schoolchildren. Community Dent Oral

1976;69:72-82.
40. Arici S, Alkan A, Arici N. Comparison of different toothbrushing protocols in poor-toothbrushing orthodontic patients. Europ J Orthod 2007;29:488–492.
41. Walsh TF, Glenwright HD. Relative effectiveness of a rotary and conventional toothbrush in plaque removal. Community Dent Oral Epidemiol 1984;12:160–164.
42. Heasman PA, Heyndrickx I, De Jager M, Sturm D. Influence of a controlled pressure system on tooth brushing behavior. J Clin Dent 2001;10:1–5.
43. Claydon N, Addy M. Comparative single-use plaque removal by toothbrushes of different designs. J Clin Periodontol 1996;23:1112–1116.
44. Renz A, Ide M, Newton T, Robinson PG, Smith D. Psychological interventions to improve adherence to oral hygiene instructions in adults with periodontal diseases. Cochrane Database Syst Rev 2007;18:1–17.
45. Kakudate N, Morita M, Sugai M, Kawanami M. Systematic cognitive behavioral approach for oral hygiene instruction: a short-term study. Patient Educ Couns 2009;74(2):191-196.