

Effectiveness Of Verbal, Verbal-Written and Video Instructions on Gingival Health of Patients with Fixed Appliances

Research Article

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Abstract

Background: Orthodontic treatment causes detrimental effects on periodontal health due to the accumulation of dental plaque. This problem can be prevented by implementing effective oral hygiene instructions (OHI).

Aim: To compare the effectiveness between verbal, verbal-written and video methods of OHI on the gingival health of patients with fixed appliances. The best method in providing OHI to patients wearing fixed appliances was also assessed.

Materials and Methods: 39 patients with a mean age of 16.9 wearing upper and lower fixed appliances were divided into three OHI groups (verbal, verbal-written and video) with five minutes standardized time allocation for each technique. Gingival health was assessed using plaque index (PI), gingival index (GI), and bleeding on probing (BOP). The mean percentage difference between pre- and post-OHI was calculated and analysed after 6 weeks. Data were analyzed using paired sample t-test and one-way ANOVA.

Results: All periodontal parameters showed a reduction in their mean % in all OHI groups after 6 weeks, with significant decrease in verbal-written and video groups ($p < 0.05$). Verbal group showed significant reduction for PI after 6 weeks ($p = 0.012$). Overall, there was no significant difference between the effectiveness of the three OHI groups in the mean % reduction of PI, GI and BOP.

Conclusions: Whilst verbal method was effective in improving the PI, verbal-written and video methods were effective in improving all aspects of gingival health (PI, GI and BOP) in patients wearing fixed appliances. However, there was no single best method in delivering OHI to patients with fixed appliances.

Keywords: Oral Hygiene; Orthodontic Appliances; Gingival Diseases.

Introduction

A significant increase in the demand of orthodontic treatment can be seen in recent years due to the growing concern of dental and smile aesthetics.[1] Although orthodontic treatment improves dento-facial appearance, it may cause regression of periodontal health by enhancing the colonization of microorganisms and dental plaque accumulation. Klukowska et al [2] found that the plaque coverage in orthodontic patients was two to three times higher

than the levels observed in high plaque-forming adults without appliances, presumably due to the various attachments used in fixed appliances which served as plaque retentive factor that complicate cleaning. In a study conducted amongst adolescent patients, the value of periodontal indices increased significantly during orthodontic treatment, but were not associated with attachment loss.[3]

Plaque accumulation contributes not only to the inflammation of periodontal tissues, but may give rise to white spot lesions,

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decalcification and cavity formation. It is therefore important to have proper plaque control as a preventive step to eliminate dental plaque. Oral hygiene instruction (OHI) is proven to benefit the patients' oral hygiene significantly by resulting in reduced plaque score and improved gingival condition.[4]

Verbal, written and video forms are the most common methods used to give oral hygiene advice in dentistry. [5] All these instructional methods given professionally by dental professionals improved gingival conditions to a certain extent. However, there was not enough evidence to support one method is better than the other instructional methods. [6, 7] These could be due to the methodological heterogeneity in these studies; Lee and Rock (2000) spent thirty minutes for each verbal OHI session, but eight minutes using video OHI methods.[6] Meanwhile, other studies limited the assessment of the dental plaque to two third of the teeth surface only. [8] Furthermore, the incorporation of single arch assessment only as compared to upper and lower arches across different studies may made the comparison of OHI methods difficult.

Thus, the present study aimed to address these shortcomings in the literature and primarily compared the effectiveness between verbal, verbal-written and video methods of oral hygiene instruction on the gingival health of patients with fixed appliances and to assess the best method in providing oral health instructions to patients wearing fixed appliances.

Materials And Methods

Study design

This was a prospective study with ethical approval obtained from IIUM Research Ethics Committee (IREC) [Registration number: IREC 2019-025].

Subjects

39 patients (31 females, 8 males) from 13 to 22 years old with a mean age of 16.9 who were undergoing fixed orthodontics treatment were recruited. Sample recruitment was done from March 2019 to January 2020. Inclusion criteria were patients who have had extraction or non-extraction treatment and had been fitted with upper and lower pre-adjusted edgewise fixed appliances (MBT prescriptions, 0.022" x 0.028" slot size) on buccal and labial surfaces during the previous 3 months, and had gingivitis on at least half the number of total teeth erupted. Exclusion criteria were subjects with impairment in hearing and vision, illiterate and patients with craniofacial syndromes.

Information leaflet and consent

Information leaflet was prepared and patient was given time to read the study design. Written consent form was given and signed by the subjects. For subjects below 18 years old, parental consent was recorded.

Oral hygiene instruction (OHI)

Group 1: A 5-minute OHI was given verbally by referring to a written script. This verbal OHI was aided by the use of a model,

a toothbrush and an interdental brush.

Group 2: A 5-minute verbal instruction supplemented with a patient information leaflet specially designed for this study was delivered. The leaflet had similar information with Group 1.

Group 3: Participants were instructed to watch a specially designed 5-minute long video at chairside with the same amount of information as in Group 1 and 2, but was presented in audio-visual format.

Each session was restricted to five minutes and subjects were given additional two minutes at the end of the session should there be any questions.

Each OHI was introduced with five sections. First, subjects were advised to use soft bristle toothbrush and fluoridated toothpaste. The second section was to emphasize on the duration of tooth brushing which was two minutes per session for twice a day. Next was to teach comprehensive brushing technique by using modified Bass technique to ensure no surfaces were left out. The participants were instructed to focus on cleaning on the gingival third and the area surrounding the brackets. The fourth section was on interdental brushing using interdental brushes to clean the area surrounding the orthodontic brackets for at least once per day. The last section was on dietary advice which focused on reducing the sugar amount and acidic food or beverage intake.

Calibration

Inter-examiner calibration was done to achieve synchronized agreement between the two clinicians (N.M. and R.H.) in terms of periodontal parameters measurements. Calibration was also done to standardize the OHI delivery of all three methods.

Clinical procedure

At the start of the study and before the instructional methods were given, each subject was examined for plaque index (PI), gingival index (GI) and bleeding on probing (BOP) on six index teeth: all second premolars (5's), upper right central incisor (11) and lower left central incisor (31). In the absence of 5's, first premolars (4's) were used. Patients were seen six weeks later and the periodontal parameters (PI, GI and BOP) were repeated for the six index teeth.

Plaque index (PI)

The index tooth was divided into eight boxes by putting imaginary lines dividing three parts of the tooth vertically and horizontally with the bracket in the centre (Figure 1).

Plaque disclosing dye (Rondell Disclosing Pellets, Directa Dental Company, Sweden) was applied on buccal and labial surfaces of the six index teeth. Subjects were then asked to rinse their mouth and the clinicians recorded the presence of plaque by placing a tick into the respective boxes in a data collection form. Plaque was scored corresponding to the eight boxes.

The maximum score for each patient was 48 ticks (8 ticks X 6 teeth). Score was calculated by adding the number of ticks on the index teeth and divided by 48. The score was then multiplied by

100 to get the number in percentage.

Gingival index (GI)

Gingival index was based on Loe and Silness (1963)[9] with a scoring of 0 to 3. The grading used for gingival index was described in Table 1.

William’s periodontal probe (Periodontal Probe 546/1, Medesy Srl, Italy) was used with gentle pressure on the same index teeth evaluated for plaque index. The tooth was examined on the buccal and labial surfaces and it was divided into three sites (mesial, mid and distal).

The maximum score for a site was 3 thus the maximum score for a tooth was 9. The maximum sum for all the teeth was 54 (score 9 x 6 teeth). Therefore, gingival index was calculated by adding the score for all sites and divided by 54. The score was then multiplied by 100 to get the number in percentage.

Bleeding on probing (BOP)

Bleeding on probing was also examined on buccal and labial surfaces of the six index teeth and it was again divided into 3 sites (mesial, mid and distal). William’s periodontal probe (Periodontal Probe 546/1, Medesy Srl, Italy) was used with gentle pressure to evaluate the BOP. Presence of bleeding was checked after a minimum of ten seconds. The score was given based on the criteria described in Table 2.

Maximum score for one site was 1, hence the maximum score for 1 tooth was 3. The maximum scoring for all six teeth was 18 (score 3 x 6 teeth). Thus, BOP was calculated by summation of the score for all sites and divided by 18. Percentage was then calculated after multiplying the score by 100.

Statistical Analysis

Descriptive statistic was used to summarize the demographic backgrounds of the subjects. As the data was normally distributed, parametric tests were used to analyse the result. Paired sample t-test was used in Statistical Package for the Social Sciences software (SPSS version 20.0, IBM Corporation, United States of America) to measure if there was any statistically significant difference between pre and post-OHI in each group. Next, one-way analysis of variance (ANOVA) was ran to compare if there was any statistically significant difference between the verbal, verbal-written and video methods. P-value was set at less than 0.05 to indicate statistical significance.

Results

39 subjects consisting of 31 females (79.5%) and 8 males (20.5%) were analysed. The mean age of the participants was 16.9 ± 2.3 and ranged from 13 to 22 years old.

Reduction of PI, GI and BOP in each group

There was a reduction in the mean percentage of PI, GI and BOP in all three groups. The t-test revealed that the reduction in verbal group was statistically significant only for plaque index ($p=0.012$). Gingival index ($p=0.085$) and bleeding on probing ($p=0.062$) did not have statistical significant reduction in the verbal group. For verbal-written and video groups, the changes in the mean percentage were much larger and the reduction of all periodontal parameters were statistically significant (Figure 2).

Comparisons of PI, GI and BOP between groups

One-way ANOVA revealed no statistically significant difference between the three groups, although the improvement in GI had $p=0.057$, a value that was very close to significance (Table 3).

Figure 1. Division of sites on buccal and labial surfaces for plaque index.

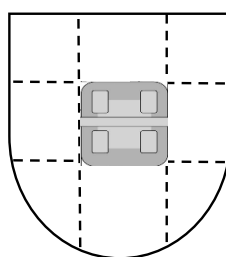


Figure 2. Pre- and post-OHI for PI, GI and BOP in verbal, verbal-written and video groups * $p<0.05$.

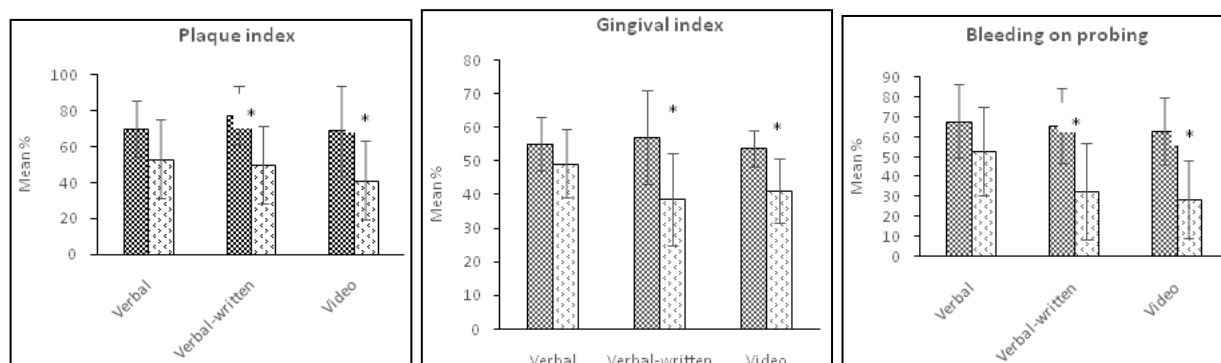


Table 1. The scoring for gingival index.

Grade	Descriptors
0	Normal gingiva
1	Slight colour change, edematous
2	Redness, edematous, bleeding on probing
3	Marked redness, ulceration, spontaneous bleeding

Table 2. The scoring for bleeding on probing (BOP).

Grade	Descriptors
0	Absence of bleeding
1	Bleeding after insertion of probe

Table 3. One-way ANOVA for the three OHI groups in the mean % difference of PI,GI and BOP.

Plaque index (PI)			
Group	Mean % difference	SD	p-value (p<0.05)
Verbal	15.89	22.16	p=0.186
Verbal-written	27.51	16.46	
Video	27.73	16.70	
Gingival index (GI)			
Verbal	6.01	12.55	p=0.057
Verbal-written	18.39	16.15	
Video	12.78	9.65	
Bleeding on probing (BOP)			
Verbal	14.96	28.60	p=0.129
Verbal-written	32.93	27.00	
Video	34.45	25.23	

Discussion

Patients wearing fixed appliances are highly associated with the deterioration of gingival health due to the increase in plaque retentive factor which enhances the accumulation of harmful microorganisms.[3, 10] In accordance with that, proper OHI to patients is very crucial to avoid the worsening of periodontal health and therefore the best technique of OHI must be properly studied to improve periodontal health.

The OHI given in this study emphasized on brushing with modified Bass technique, using soft bristle toothbrushes and fluoridated toothpaste for two minutes as they were proved to improve oral hygiene and gingival health of orthodontic patients.[11] Interdental brushing and reduction in dietary sugar intake were also recommended to maximise the beneficial effects on periodontal health. Interdental cleaning improves the effectiveness of eliminating plaque interdentally which contributes to inflammation of gingiva,[12] and controlled sugar may reduce the formation of the plaque itself.[13]

Three periodontal parameters used in this study were PI, GI and BOP. All three parameters were non-invasive, and were indicators of different aspects of periodontal health. Plaque index was

analysed because dental plaque is the main predisposing factor for gingivitis and periodontitis.[14] Meanwhile, gingival index assessed the degree of inflammation at the marginal gingiva area and bleeding on probing was used to indicate the gingival condition at the base of the sulcus.[15]

Subjects in the verbal-written group exhibited significant improvements in their periodontal parameters (PI, GI, BOP). Our finding is parallel with the findings from Johnson and Sandford [16] and Zuhail et al [17] who found that health instructions given both verbally and written were more effective than verbal only. In our study, standardization was a crucial key in the effectiveness of the OHI as the information can be disseminated evenly supplemented with written materials. Our research contrasts with that of Lees and Rock [6] who argued that written information resulted in the least improvement in the gingival health of patients wearing fixed appliances when compared to verbal and video techniques. The difference could be explained by the fact that their subjects brought the illustrated instructions home without any verbal component. It is also unclear whether the patients actually took the initiative to read the written materials provided. Therefore, it would appear that verbal OHI when given with written materials could increase the effectiveness of information delivery when compared with verbal or written instructions alone.

Shah et al [18] and Moshkelgosha et al [8] pointed out that subjects

receiving video OHI had significant improvement in their gingival health, similar to that found in our study. A likely explanation is that standardization of information could be implemented via audio-visual format and that the instructions could be replayed as many times as required.[18] Although participants who were illiterate were excluded, video OHI might be better appreciated by this group of patients in real world due to its dynamic, interesting and lively characteristics. It was interesting to highlight that in our clinical observations, patients who received video-type OHI were more engaged in the advices given, most probably stems from the animation and illustration as well as the usage of various colours which attracted their attention. Thus, verbal instructions supplemented by visuals or written instructions helped improve the gingival health of fixed appliance patients in our study.

On another side, our result contradicted with Lees and Rock [6] who found that verbal OHI method resulted in the most improvement in periodontal health. Their instructions given to the subjects were not standardized especially in the duration, which lasted up to thirty minutes in some subjects. The long OHI duration was not employed in our study due to the possibility of low attention span in adolescent group. The different method in obtaining the plaque index in which they excluded the incisal/occlusal third of the index tooth may also affect the result. Although they believed that fixed appliance components only affected cleansing at the gingival two-thirds, our opinion and findings differ as the incisal part of the bracket was also a plaque retentive site. The presence of plaque at the incisal third was particularly common. Subjects were also more likely to lose interest during verbal OHI due to the lack of visual aids, and verbal-only information did not help with information retention among adolescents.[19] It was also noteworthy to point that only plaque index showed improvement for verbal group. From our perspective, due to the lack of attention given by the patients during verbal OHI, they might be less proactive in practicing the advices given. Since changes in the state of gingival inflammation (reflected by GI and BOP) need longer duration to manifest,[20] only plaque index showed significant improvement in our study.

Our study did not find any significant differences between the effectiveness of the three groups. This may be caused by other factors apart from the techniques of delivering the advices. From the ten social determinants of health outlined by World Health Organization (WHO), the factors which are relevant to oral health are dietary style and social gradient,[21] which might play a role in the patients' oral health condition, despite the success of various OHI techniques delivered.

Excessive sugar intake is harmful for oral health as it may contribute to the formation of dental plaque and cause oral diseases. [13] Although advices on dietary sugar intake was included in our OHI, its relation to the gingival health was not assessed. For instance, verbal group might have more subjects who have high sugar intake than the video group and as a result, the improvement of oral hygiene of patients receiving verbal OHI might be less remarkable than the video OHI group.

Next, people who are lower down the social hierarchy are two times more likely to have serious diseases due to unfavourable social surrounding and economical factor.[21] This is significant since subjects with lower socioeconomical status tend to have higher sugar intake and have less exposure to effective oral hy-

giene.[22] Therefore, participants having different lifestyle might not have the same level of motivation in improving their oral hygiene practices albeit similar information delivered during OHI.

Changes in patients' oral health is very dependent on the level of knowledge and attitude exhibited by the individuals. This can be understood through the 'knowledge, attitude, practice' (KAP) theory by Pine and Harris.[23] A health education must follow the KAP route to ensure success in patient's attitude and behavioural change. This model implies that practice is a patient's response to the information given, and therefore factors affecting the level of knowledge and attitude of the person affect significantly their level of application. The knowledge component was given in our study by delivering the OHI through the three different methods. However, the ability of the participants to truly understand and practise the advices given were not objectively assessed.

The findings of this study might be helpful in facilitating the clinicians and dental hygienist when emphasizing on the importance of proper plaque control in patients wearing fixed appliance. Although it did not indicate one specific OHI method is better than the other, the results revealed that oral hygiene instructions still play a very important role in maintaining good gingival health throughout the fixed appliance treatment regardless of the methods of delivery. The visual aids and leaflets used in the study have the potential to be used as powerful educational tools during OHI and orthodontic consent process.

Studies with longer duration of follow-up could be done because the rate of gingival health improvement may vary from patients to patients, and their long-term compliance to the instructions could be assessed. In addition, studies to focus on patient's challenges in practising the oral health instructions could be done.

In conclusions, whilst verbal method is effective in improving the plaque index, verbal-written and video methods were effective in improving all aspects of gingival health (plaque index, gingival index and bleeding on probing) in patients wearing fixed appliances. There is no single best method in delivering oral hygiene instructions to patients with fixed appliances.

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