Comparison of modified Bass technique with normal toothbrushing practices for efficacy in supragingival plaque removal

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Abstract: Objectives: This study was designed to compare the efficacy in supragingival plaque removal of normal toothbrushing practices and a particular toothbrushing technique, the modified Bass method. Subjects and methods: The research consisted of two identical experiments with two toothbrushing methods: the normal toothbrushing practices and the modified Bass technique. Forty-six secondary, non-dental students (10 males and 36 females) with ages ranging from 18 to 30 years were selected. Dental plaque was assessed according to the Turesky modification of Quigley–Hein Index. Subjects were requested not to brush their teeth 48 h prior to the baseline record of plaque index. Participants were instructed to brush twice daily during 3 min for the duration of the 3-week trial using their usual toothpaste. Plaque index was recorded at 2, 7 and 21 days. Results: The modified Bass (Mod-Bass) technique was significantly (P < 0.05) more effective in removing supragingival plaque than normal toothbrushing practices both in all, buccal and lingual sites. After 21 days, the normal practices did not significantly decrease mean plaque indices compared to the scores calculated after 7 days (P > 0.05), but did so with the modified Bass technique (P < 0.05). The modified Bass technique was specially efficient at the lingual sites where it was 2.9-fold more effective than normal practices in reducing plaque scores (P < 0.01). Conclusion: The results show that a particular toothbrushing technique as modified Bass method is significantly superior to normal toothbrushing practices in supragingival plaque removal. The introduction of a specific toothbrushing technique, such as modified Bass technique represents an important improvement in the oral hygiene of the patients.

Key words: plaque; oral hygiene; modified Bass method, manual toothbrushing; normal toothbrushing practices
Introduction

The role of dental plaque in the aetiology of gingivitis has been well documented (1) with the control of periodontal disease progression dependent on optimal plaque control (2). The most common method is personal oral hygiene using a toothbrush (3).

There is substantial evidence that manual toothbrushes are effective in removing bacterial plaque and preventing gingivitis (4). Toothbrushes are over-the-counter products and therefore no special instruction for use is given when purchased, except that sometimes a printed instruction is included from the manufacturer. The normal toothbrushing practices adequately performed by anyone could be sufficient to control bacterial plaque. However, several toothbrushing methods have been proposed (5), the Bass technique (6) and the Roll method being two of the most commonly recommended techniques in dental practice (7, 8).

The Bass technique is superior to the Roll method in cleaning the tooth tissue adjacent to the gingival tissue, the gingival margins and the sulcus (9). Katz et al. (10) recommended the modification of the Bass method combining this technique with the Roll method (modified Bass (Mod-Bass) technique) to ensure the complete plaque removal of both coronal surfaces and gingival margins.

Toothbrushing removes dental plaque and increases oral hygiene. However, the dentist has two alternatives to improve the oral hygiene of the patients using toothbrushing, i.e. (a) to introduce a specific toothbrushing method or (b) to better the performance of his normal toothbrushing practices. But all studies have definitively demonstrated that the introduction of a specific toothbrushing technique produces a superior increase of oral hygiene that the normal toothbrushing practices perform with improvement. This fact, together with the idea that no toothbrushing method has been shown to be clearly superior to others, caused the suggestion of Frandsen (11) that improvement in oral hygiene of periodontal patient must not be achieved by the development of better specific brushing methods but rather by improved performance by the persons using any one of the accepted methods.

In order to achieve an evidence-based decision in this matter, it is required to carry out studies comparing the efficacy in plaque removal of the normal toothbrushing practices performed with improvement, and specific toothbrushing methods. The results of these studies would be of interest in the treatment of the patient with periodontal disease because one of the most difficult things, and always a challenge for the dentist, is to get to change the normal toothbrushing practices of periodontal patient, especially when a personal toothbrushing method has been used for years.

Therefore, in this study the efficacy for supragingival plaque removal of the normal toothbrushing practices and the modified Bass technique are compared.

Subjects and methods

Subjects

From the ‘Instituto Santa Aurelia’ (secondary school) at Seville (Spain), 46 secondary students, 10 males and 36 females, were selected. Their ages ranged 18–30 years. They were screened to exclude those having: (a) orthodontic banding; (b) crowding; (c) periodontal pocket ≥4 mm; (d) fewer than six natural teeth in each quadrant. None of the students were taking antibiotics during the study. The DMF-T index ranged 2–18, but nobody had large (open) cavities retaining bacterial plaque. The conduct and reporting of the study adhered to the criteria recommended for good clinical practice. Subjects voluntarily gave signed and witnessed agreement to participate after receiving verbal and written information concerning the study.

Prior to each part of the experiment, at baseline subjects were given a thorough prophylaxis to remove plaque, calculus and stain. None of the students had a Ramfjord (12) calculus index >0.3 at the beginning of the experiments. No subject drops out of the study.

Plaque index

Plaque was assessed, after dissolving in 0.5% erythrosine (Plac-Control®, Dentaic S.A., Parc Tecnologic del Vallès, Cerdanyola, Spain), by the Turesky modification of the Quigley–Hein Index (13).

The examiner was trained and experienced in clinical trials of oral hygiene (14). The examiner was ignorant of the toothbrushing technique used by the subjects while scoring the plaque. Agreement between initial and repeat assessments of plaque index was quantified by the κ statistics (15). There was good agreement for plaque scoring (κ > 0.85).

Toothbrush and toothpaste

Both normal toothbrushing practices and Bass–Roll combined method were performed using a standard toothbrush (Vitis®, Dentaic S.A., Parc Tecnologic del Vallès, Cerdanyola, Spain). The toothbrush had a small head with 40 tufts arranged in four rows. The filaments were made of Tynex® with a length of 12.0 mm and a diameter of 0.20 mm. Number of filaments per tuft was 44. The toothpaste used was Lacer® (Sardenya, Barcelona, Spain).
Part I: normal toothbrushing practices

The subjects were asked to abstain from oral hygiene procedures for 48 h. Then, the examiner (M.P.) evaluated the amount of dental plaque using the Turesky modification of Quigley–Hein Index. After baseline record of plaque index, subjects were instructed to brush twice daily for the duration of the 3-week trial. Because plaque-removing efficacy increases with brushing time (16), toothbrushing duration was standardised at 3 min. Brushing was to be normally practised. No other instruction or oral hygiene advice was given. Subjects were not permitted to use any oral hygiene products other than those assigned for the study. Recall visits were at 2 days, 1 and 3 weeks when plaque was recorded according to the same criteria used at baseline. Reinforcement was not carried out during the recall visits.

Part II: modified Bass brushing technique

Concluded the first part of the experiment, all the subjects were a period of 2 weeks without any specific toothbrushing instructions. Then, the second part of the experiment was conducted as follows.

After a new prophylaxis to remove plaque and calculus, the same 46 subjects were newly asked to abstain from oral hygiene procedures for 48 h. Then, the same examiner evaluated the amount of dental plaque using the Turesky modification of Quigley–Hein Index. After baseline record of plaque index, the subjects were instructed to brush their teeth using the combined Bass–Roll method (modified Bass technique) as follows: bristles must be directed towards the base of the tooth at the gum line and at a 45° angle to the long axis of the tooth, the brush head is kept in contact with the gingivae and the tooth and gentle force is applied to insert bristle ends between the gum and the tooth; five gentle but firm vibratory strokes are used without removing bristle ends from the gumline; then, the brush filaments are placed on the attached gingivae at an angle of 45° and rolled down over the tooth occlusally five times.

Instruction on modified Bass technique was performed using a model and seeing the video ‘Periodontia N°1’ (17). The subjects were asked to perform the modified Bass technique twice daily during 3 weeks. All the other conditions asked in the first part of the experiments, including motivation, were maintained in the second one. Recall visits were at 2 days, 1 and 3 weeks when plaque was recorded according to the same criteria used at baseline. Reinforcement was not carried out during the recall visits. No other instruction or oral hygiene advice was given.

Data analysis

Plaque index scores were expressed as mean ± SD. The mean plaque index was calculated for the whole mouth and separately for the buccal and for the lingual surfaces for each quadrant and sextant in both maxillary and mandibular arch for all individuals. The differences among the scores found in different examinations were assessed using the analysis of covariance (ANCOVA). The baseline score (48 h plaque accumulation) was used as covariate. Comparison of the percentage reduction between the two toothbrushing methods was performed using the Wilcoxon test for matched pairs. Statistical significance was established at the $P < 0.05$ level.

Results

Mean plaque indices for all sites and partial mean plaque indices calculated for upper and lower arch of each quadrant and for each sextant were essentially identical both in normal toothbrushing practices and modified Bass technique at the baseline examinations ($P > 0.05$).

The modified Bass technique removed significantly more plaque than the normal toothbrushing practices ($P < 0.05$) (Table 1).

Table 1. Mean plaque index expressed as percentage of baseline scores of all, buccal and lingual sites for normal toothbrushing practices and modified Bass technique at each examination

<table>
<thead>
<tr>
<th>Examination</th>
<th>All sites</th>
<th>Buccal only</th>
<th>Lingual only</th>
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<tbody>
<tr>
<td></td>
<td>Normal practices</td>
<td>Mod-Bass technique</td>
<td>Normal practices</td>
</tr>
<tr>
<td>Mean plaque scores baseline</td>
<td>3.11 ± 0.54</td>
<td>3.19 ± 0.57</td>
<td>3.47 ± 0.67</td>
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<tr>
<td>2nd day</td>
<td>48.23a</td>
<td>39.49**</td>
<td>36.31a</td>
</tr>
<tr>
<td>7th day</td>
<td>42.12</td>
<td>26.96***</td>
<td>32.56</td>
</tr>
<tr>
<td>21st day</td>
<td>45.02</td>
<td>17.24***</td>
<td>34.87</td>
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Coefficient of variation was ≤14% in all cases.
aSignificantly lower than the previous examination ($P < 0.05$).
*Significantly lower than the normal toothbrushing practices ($P < 0.05$).
**Significantly lower than the normal toothbrushing practices ($P < 0.01$).
Table 2. Range of scores for individual subjects and standard deviations for the group of all, buccal and lingual sites for normal toothbrushing practices and modified Bass technique at each examination

<table>
<thead>
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<td>Normal practices</td>
<td>Mod-Bass technique</td>
<td>Normal practices</td>
<td>Mod-Bass technique</td>
</tr>
<tr>
<td>Baseline</td>
<td>1.60–4.20 (0.54)</td>
<td>1.67–4.27 (0.57)</td>
<td>1.85–4.83 (0.67)</td>
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<tr>
<td>2nd day</td>
<td>0.42–2.46 (0.50)</td>
<td>0.28–2.94*** (0.48)</td>
<td>0.19–2.71** (0.61)</td>
</tr>
<tr>
<td>7th day</td>
<td>0.12–2.26 (0.49)</td>
<td>0.21–2.00*** (0.39)</td>
<td>0.12–2.67 (0.57)</td>
</tr>
<tr>
<td>21st day</td>
<td>0.23–2.60 (0.54)</td>
<td>0.01–1.62*** (0.36)</td>
<td>0.21–2.82 (0.54)</td>
</tr>
</tbody>
</table>

*Significantly lower than the previous examination (P<0.05).
**Significantly lower than the normal toothbrushing practices (P<0.05).
***Significantly lower than the normal toothbrushing practices (P<0.01).

Although both normal practices and modified Bass technique showed a significant reduction in mean plaque indices for all, buccal and lingual sites after 2 days, compared to the baseline levels (P<0.05), the mean percentage reduction in the plaque scores were significantly higher with the modified Bass technique compared to the normal toothbrushing practices for all (P<0.05), and lingual (P<0.01) sites. Moreover, after 7 days the modified Bass technique again significantly decreases mean plaque indices for all, lingual and also buccal sites compared to the scores calculated on second day (P<0.05). On the contrary, after 7-day plaque removal from all and buccal sites with normal toothbrushing practices did not significantly differ of those calculated at second day (P>0.05). After 21 days the normal practices did not decrease mean plaque indices compared to the scores calculated at 7 days (P>0.05), but the modified Bass technique again reduced them significantly (P<0.05). The mean percentage reduction in the plaque scores after 21 days using the modified Bass technique were 2.6-, 2.2- and 2.9-fold higher than with the normal toothbrushing practices for all, buccal and lingual sites, respectively (P<0.01).

The ranges of scores (mean ± SD) for individual subjects for the group of all, buccal and lingual sites for normal toothbrushing practices and modified Bass technique at each examination are shown in Table 2. After 21 days, the maximum range of plaque scores for all sites using normal toothbrushing practices was 2.60. On the contrary, the maximum range of plaque scores with the modified Bass technique was much lower (1.62; P<0.05).

Discussion

Many different methods of toothbrushing have been developed: eg. Bass, Stillman’s, Fone’s, Charter’s, Roll (18). Although these techniques have been taught by dental professionals for at least 20–40 years, over 90% of the population employ their ‘personal toothbrushing method’, generally the popular ‘scrub’ method. Thus, normal toothbrushing practices normally consist of vigorous horizontal, vertical and/or circular movements (10). While this method will successfully remove plaque from smooth outer and inner surfaces of the teeth, it is generally considered detrimental because vigorous scrubbing can encourage gingival recession and, with a dentifrice of sufficient abrasiveness and a hard textured toothbrush, can create areas of tooth abrasion (19).

Clinical reports have demonstrated the effectiveness of Bass method (21), and several studies have compared the Bass method with other toothbrushing techniques. Gibson and Wade (9) compared the effectiveness of the Bass method and the Roll technique in plaque removal showing that the Bass method was superior in cleaning the tooth tissue adjacent to the gingival tissue of the lingual and facial aspects but no significant differences were shown in the overall effectiveness. Arai and Kinoshita (20) found that Bass method was less effective in plaque removal than horizontal scrub, Charter’s method, Fone’s method and Stillman’s method. Robinson (21) did not find significant differences between Bass method and horizontal scrub. Bergenholz et al. (7) compared the Bass method with three other techniques: the Roll method, the circular scrub and the horizontal scrub, showing that the Bass method was superior to the other three techniques in supragingival plaque removal from the lingual surfaces. Morita et al. (22) compared the Bass method and the Toothpick method (23) and a significant difference in the cleaning effectiveness of the two methods could not be demonstrated. So far, no method of toothbrushing has been shown to be clearly superior to others.

Clinical practice shows us that patients pay poor attention to the lingual sites during their normal toothbrushing practices, probably because these sites do not affect the aesthetics and have a more difficult access (24). Even the lingual sites of the anterior sextants, easily accessible to the toothbrush, are often forgotten. The effectiveness of the modified Bass technique was specially evident in the lingual sites of the anterior sextants where, at 21 days, the modified Bass technique was 2.9-fold more effective than normal practices in reducing plaque scores.
The marked improvement of the oral hygiene at the lingual sites could be explained by several factors:

1. The so-called Hawthorne effect (25), i.e. the positive change in the behaviour of a subject as a result of the special attention and status received from participation in an investigation (for review, see Addy et al. (25)). As a result of subjects knowingly being involved in an oral hygiene study, usually there is an improvement in toothbrushing in all groups.

2. The subjects were instructed about the importance of cleaning all sites.

3. In the modified Bass technique, the toothbrush is positioned specifically with the bristles directed toward the base of the tooth at the gumline and at an angle of 45° to the long axis of the tooth, with the brush head contacting with the gingivae and the tooth. Thus, the roll movements produce a complete cleaning of the lingual sites when the brush filaments are rolled down over the tooth occlusally.

4. The increased motivation that a new toothbrushing technique produces in the patient. The same factors could explain the higher effectiveness of the modified Bass technique at the lingual sites of the right posterior sextant.

The motivation provoked by the Hawthorne effect, also present in the Bass technique part of the study, give us surety on the improved performance of both normal toothbrushing techniques and modified Bass method. Thus, it can be expected that the comparison of the plaque index obtained with both toothbrushing techniques was trustworthy. Taking into account that prior to using the modified Bass technique, subjects were given special instructions, this would likely have motivated the subjects more than in the normal toothbrushing part of the study. Thus, the reduction in plaque scores seen in the modified Bass technique portion of the study may be owing to the additional time and effort spent with subjects rather than the technique per se.

The effectiveness of the modified Bass method in supragingival plaque removal showed in this study demonstrates that this combined toothbrushing technique can be considered as a good method for supragingival plaque removal in comparison to normal toothbrushing practices. The introduction of a specific toothbrushing method significantly improved the level of oral hygiene.

References


