

# Comparison of two types of Toothbrushes along with Vertical Brushing Technique and Modified Bass Technique for Efficacy of Plaque Control in Orthodontic Patients - A Randomized Control Trail

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## **Abstract**

**Introduction** - Plaque control is major consensus during orthodontic treatment to prevent periodontal inflammation. **OBJECTIVE** – The aim of this study to assess oral hygiene status and periodontal health amongst the orthodontic patients.

**Methodology** - A total of 60 patients were selected with ages between 14 to 24 years old with fixed orthodontic appliances. After the phase 1 therapy the parameters evaluated were OHIS & gingival index & patients were randomly assigned to one of the 4 groups. **GROUP 1** – conventional brush with vertical brushing technique. **GROUP 2** – conventional brush with modified bass brushing technique. **GROUP 3** - orthodontic brush with vertical brushing technique. **GROUP 4** - orthodontic brush with modified bass brushing technique.

**Results** - The result shows a significance decrease in OHIS & gingival index in group 4 as compared to other group in 1 month. **CONCLUSION** – Thus, it can be suggested that using orthodontic toothbrushes along with Modified Bass Technique is more effective in reducing the plaque accumulation & maintaining the gingival status in patients with fixed orthodontic appliances.

## **INTRODUCTION**

Maintaining good oral hygiene is major consensus for patients undergoing orthodontic treatment.<sup>1</sup> Fixed orthodontic appliance on any patient presents a favorable situation for rapid plaque accumulation

requiring enhanced programs of personal oral hygiene and regular professional prophylaxis. Although mechanical cleansing of tooth surfaces becomes a central requirement and can be accomplished in various forms, consisting tooth brushing complimented with the use of dental floss.

In the patients with fixed orthodontic appliances this process becomes a little strenuous and these patients need extra attention to modify the conventional technique seeking the best for them.<sup>2</sup> According to ADA specification for conventional toothbrush: Length of brushing surface: 1-1.25 inches & Width of brushing surface: 5/16 – 3/8 inches. Rows of bristles: 2-4, Tufts per row: 5-12 & Bristle per tuft: 80-86.<sup>3,4</sup> (Fig 1b).

Generally, orthodontic toothbrushes have a V-shaped groove along the long axis of the toothbrush head. The shorter nylon bristles in the V-shaped groove are progressively firmer and more efficient in removing food debris from the mid bracket region, along with that the comparatively longer and softer filaments are positioned in the bracket-wing region (Fig 1a).

Tests of the effectiveness of the Orthodontic toothbrush compared with the conventional toothbrush in reducing plaque and gingivitis on teeth with fixed appliances have had conflicting results.<sup>1</sup>

Not only the brush but the brushing technique is also of great significance. The tooth brushing techniques most used in orthodontic patients are: Ramfjord's method, modified Stillman and Bass method.<sup>5</sup> Control studies evaluating the effectiveness of usual brushing techniques do not show clear advantage for any of the methods. It is probable that the scrubbing technique is the most simple and common brushing method. Studies have indicated that minimal periodontal disease, bone loss, and caries will occur in adolescents during the course of fixed appliance therapy, if adequate plaque control is not maintained.<sup>6</sup>

Therefore, Patients must be provided information and should be given enough education about periodontal health, disease relating to the same and thereby developing habits of plaque control. Patient must understand their role in the maintenance of periodontal health or else long term success of the treatment is unlikely to happen.<sup>7</sup>

## **OBJECTIVE**

The aim of this study is to assess the effectiveness of different brushing technique with two different toothbrushes on oral hygiene status and periodontal health amongst the patients with fixed orthodontic appliances.

## **MATERIAL AND METHODS**

A total of 60 patients were selected from the out patient department from the department of Orthodontics And Maxillofacial Orthopedics, Jaipur Dental College, MVGU, ages between 14 to 24 years with fixed orthodontic appliances.

### **Inclusion Criteria:**

- Fixed orthodontic appliances in upper and lower arch.
- Full complement of permanent teeth.
- Absence of systemic disease.

### **Exclusion Criteria:**

- No use of antibiotics in past 3 months.
- Poor oral hygiene
- No deleterious habit.
- patients who are mentally or physically challenged.
- patients with cleft palate where oral hygiene regimen could be compromised.

Two different toothbrushes were compared with two different brushing technique by dividing all the 60 patients into groups. The brushes used were conventional brush and orthodontic brush and the techniques used were Modified Bass Technique and Vertical Brushing Technique. In Modified bass technique, the head of the brush is kept parallel to the occlusal plane, with the brush head covering almost 3-4 teeth starting from the distal most teeth of the arch. The bristles are placed at the gingival margin at an angle of 45 degrees to the long axis of the tooth. Gentle vibratory pressure is given using short back and forth movement dislodging the tips of the bristles. Bristles are swept rolling towards the occlusal surface.<sup>8</sup> In Vertical/Leonard brushing Technique, the bristles are placed at 90 degree angle to the facial surface on the clenched anterior & posterior teeth. The maxillary and mandibular arch are brushed separately. Brush vigorously without great pressure with up and down stroke on tooth surface. Pressure, enough to force the filaments into interdental areas is applied, so much so soft tissues should not be injured.<sup>9</sup>

Similar oral hygiene instructions were given to each patient. At baseline the parameters evaluated were: OHI-S (Oral Hygiene Index Simplified)<sup>10</sup> and Gingival index (GI)<sup>11</sup> and patients were randomly assigned to one of the 4 groups:

- **Group 1** - In group 1 patients were given conventional brush and were asked to brush using Vertical brushing technique. (Fig 3)
- **Group 2** - In group 2 patients were given conventional brush and were asked to brush using with modified bass technique.

- **Group 3** - In group 3 patients were given orthodontic brush and explained to brush using with vertical brushing technique.
- **Group 4** - In group 4 patients were given orthodontic brush and explained to brush using with modified bass technique. (Fig 2) OHIS and GI were re – evaluated after one month. (Fig 4 & 5).



**Fig 1a:** Orthodontic Toothbrush  
**1b:** Conventional Toothbrush



**Fig 2:** Modified Bass Technique Using Orthodontic Toothbrush



**Fig 3:** Vertical Brushing Technique Using Conventional Toothbrush



**Fig 4:** Oral Hygiene Index - Simplified (OHI-S)



**Fig 5:** Gingival Index (GI)

**STATISTICAL ANALYSIS:**

All the data were subjected to statistical analysis using SPSS (Statistical Packages for Social Sciences) 20.0. One-way analysis of variance

(ANOVA) was used for intergroup comparison of oral hygiene and gingival status. Paired *t*-test was used for comparison of oral hygiene and gingival status from baseline to 1 month within each group.

## RESULTS

**TABLE 1: Distribution of 60 patients according to proposed treatments**

GROUP 1 (n =15)	GROUP 2 (n = 15)	GROUP 3 ( n = 15)	GROUP 4 (n = 15)
Convention al brush with vertical brushing technique	Convention al brush with vertical brushing technique	Orthodonti c brush with vertical brushing technique	Orthodonti c brush with modified bass technique

In the sample of 60 patients diagnosed, the mean OHI (S) score among the groups of patients were given different health care measures, was compared at baseline and 1 month in 4 study groups. Table 2 and fig 6.

**Table 2: OHI (S) score at baseline (B) and 1 month.**

OHI (S)	n	Baseline	1 Month
		Mean (SD)	Mean (SD)
Group 1	15	1.75 (0.6)	1.48 (0.5)
Group 2	15	1.68 (0.62)	1.14 (0.53)
Group 3	15	1.52 (0.58)	1.18 (0.47)
Group 4	15	1.84 (0.59)	1.02 (0.42)
Total	60	1.70 (0.60)	1.21 (0.48)
ANOVA F-value		0.77	2.47
p-value		0.52	0.07

(OHI(S) - Oral hygiene Index Simplified, \*significant when  $p < 0.05$ , F-is test value of Analysis of Variance)

The intergroup analysis among study groups of OHI (S) showed that there was statistically no significance with  $p > 0.05$ , when one group compared to the other three groups for baseline as well as after 1 month.

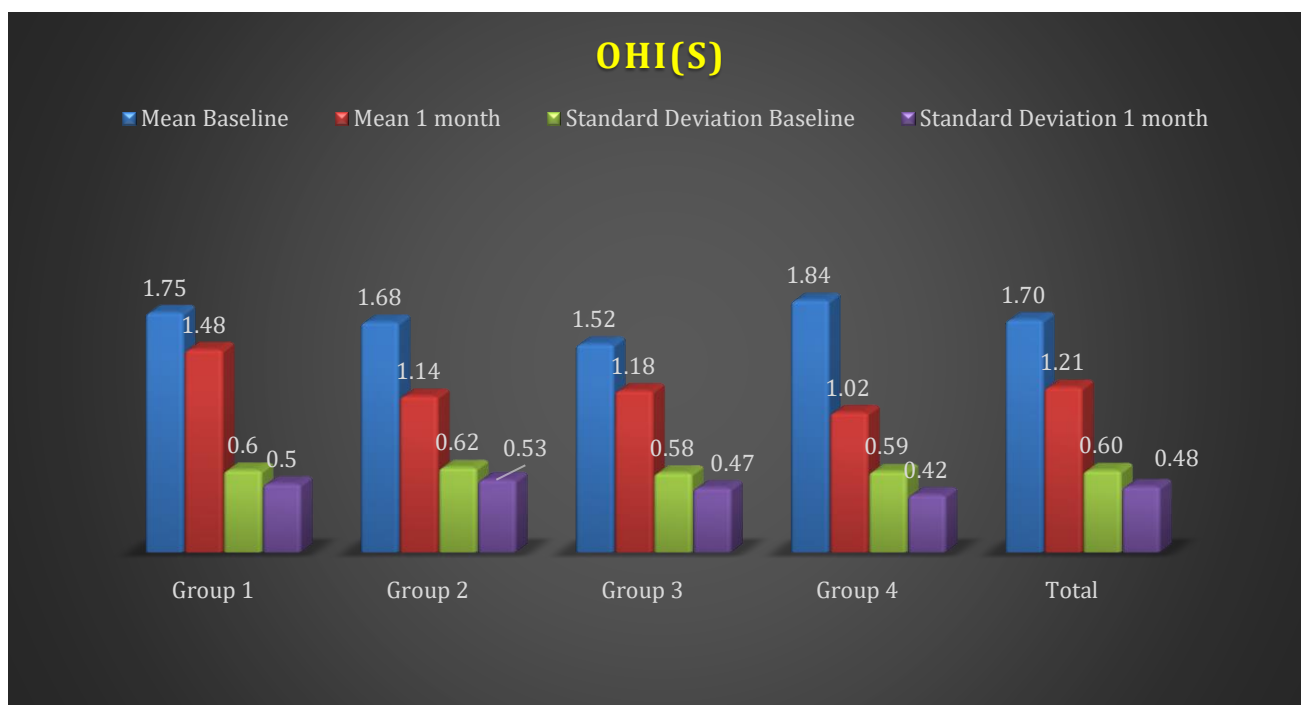
The OHI (S) score measured from baseline to 1 month, when compared to the other three groups. The results were statistically very highly significant ( $P < 0.05$ ).

**Table 3. Comparison of OHI (S) scores from baseline to 1 month.**

	Paired differences	Significant 2-tailed
	Mean	
OHI(S)-Baseline to OHI(S) - 1 Month	0.49	<0.0001*

(OHI(S) - Oral hygiene Index Simplified, \*significant when  $p < 0.05$  F-is test value of Analysis of Variance)

The mean GI score among the groups of patients were given different health care measures was compared at baseline and 1 month in 4 study groups. Table 4 and fig 7.



**Fig 6: Column Chart Showing OHI (S) Score at Baseline (B) And 1 Month**

**Table4. GI score at baseline (B) and 1 month.**

GI	n	Baseline	1 Month
		Mean (SD)	Mean (SD)
Group 1	15	2.64 (0.59)	2.42 (0.57)
Group 2	15	2.75 (0.62)	2.21 (0.52)
Group 3	15	2.62 (0.58)	2.24 (0.56)
Group 4	15	2.86 (0.68)	2.06 (0.53)
Total	60	2.72 (0.62)	2.23 (0.55)
ANOVA F-value		0.48	1.10
p-value		0.7	0.36

GI- Gingival Index, \*significant when  $p < 0.05$ , F-is test value of Analysis of Variance

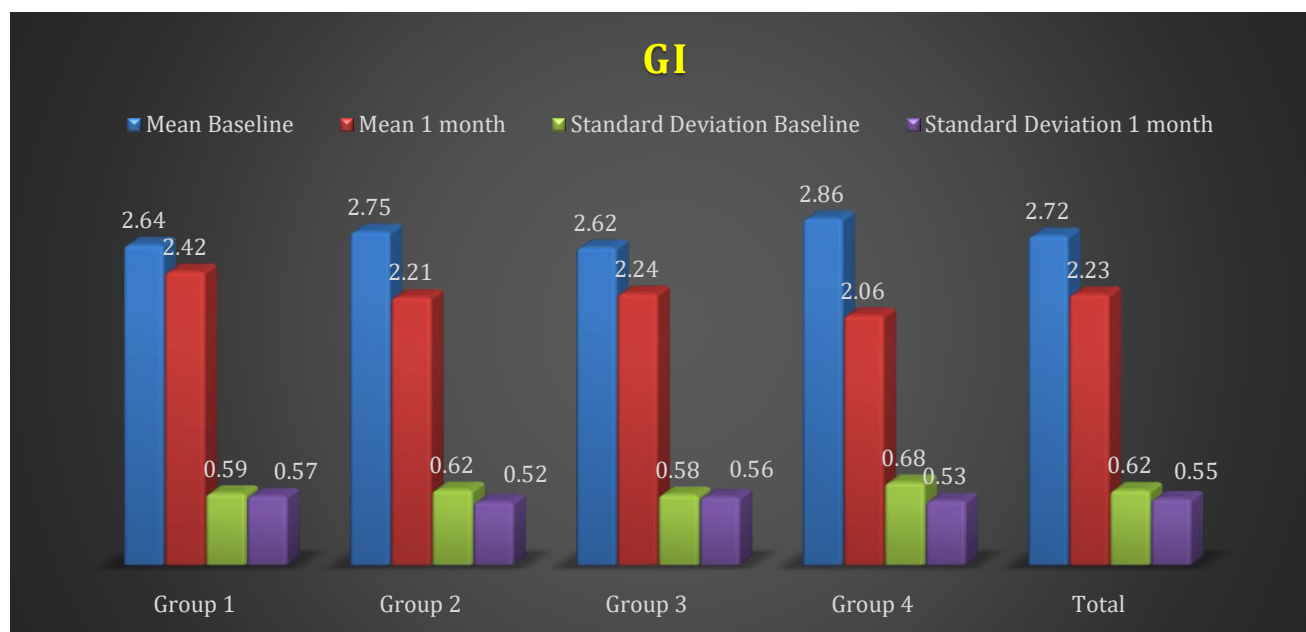
The intergroup analysis among study groups of GI showed that there was statistically no significance

with  $p > 0.05$ , when one group compared to the other three groups for baseline as well as after 1 month. The GI score measured from baseline to 1 month, when compared to the other three groups. The results were statistically very highly significant ( $P < 0.05$ ).

**TABLE5. Comparison of GI scores from baseline to 1 month.**

GI-Gingival Index \*significant when  $p < 0.05$

	Paired differences	Significant 2-tailed
	Mean	
GI Baseline to GI- 1 Month	0.4	<0.0001*



**Fig 7: Gingival Index Score at Baseline (B) And 1 Month**

## DISCUSSION

As discussed, the aim of this study was to assess the effectiveness of different brushing technique with two different toothbrushes on oral hygiene status and periodontal health amongst the patients with fixed orthodontic appliances. The results have revealed that a comprehensive oral hygiene care program helps the patients to control plaque and calculus, decrease gingival inflammation and maintain their oral health status. The effect did not tend to divert with respect to gender or age group. Davies et al. indicated that although orthodontically treated patients have lower plaque and gingival index scores than did an untreated control group

after a 3-year follow-up, the difference was ascribed more to greater awareness of oral hygiene than to the orthodontic therapy itself.<sup>12</sup>

The main goal of orthodontic treatment is to improve dental occlusion and teeth in alignment, which ultimately results in a good functioning of dentition. Although orthodontic treatment with fixed appliances offer disadvantages to the patient, fixed orthodontic appliances can trap food easily, which contributes to plaque formation. If plaque is not carefully removed from teeth and brackets, patients are at a risk of developing gingivitis, dental caries, and oral malodor. There is a direct

relationship between oral health (plaque) and caries incidence in orthodontic patients.<sup>1</sup>

This study was carried out to assess oral hygiene behavior among patients wearing fixed orthodontic appliances. Tooth brushing is the first line of defense in removing debris and plaque accumulated around orthodontic appliances. It is important that patients undergoing orthodontic therapy thoroughly clean their teeth with a toothbrush for a minimum of 2 minutes after every meal (at least 3 times a day). Adolescents exhibit a higher level of supragingival plaque and a higher incidence of gingivitis than adults. Thus, the sample age of 12–18 years was selected in this study.

Patricia et al 2013 suggested that Bass technique can be effective in reducing periodontal clinical parameters of Plaque index and Gingival index in patients with fixed orthodontic appliances.<sup>5</sup>

Zachrisson BU in 1971 conducted a study in which horizontal scrubbing technique of brushing was taught after plaque disclosure, as vertical brushing technique has been found to be inadequate in cleaning gingival margins.<sup>13</sup>

Boyd 1983 conducted a study to evaluate the effect of plaque control measures on gingivitis and found that a structured plaque control program only was effective in reducing dental plaque and gingivitis, provided there was periodic reinforcement at 4- to 7-week intervals; otherwise, the gingivitis scores tend to increase to pre orthodontic treatment level, on cessation of reinforcement.<sup>14,15</sup>

Boyd et al. found that even in patients with periodontal diseases before orthodontic treatment, their periodontal health condition would be the same as general patients during and after treatment if they paid attention to oral hygiene care and followed periodontal conditions at regular times during orthodontic treatment.<sup>14</sup>

Zvi Rafe 2006 has done a study in which he concluded that orthodontic brushes gives better result than conventional brushes to improve tooth and gingival health in orthodontic patients with fixed appliances which is similar to this study.<sup>1</sup>

Previous studies have suggested that orthodontic appliances result in an increase in plaque, with a consequent increase in bacterial numbers and bacterial byproducts.<sup>16</sup>

Navneet et al 2019 presented a study in which he said that modified bass brushing technique is an important tool in maintaining good oral hygiene.<sup>16</sup>

Hobson et al. investigated the oral hygiene advice that orthodontists gave to patients undergoing routine orthodontic treatment. They found that all orthodontists gave advice on tooth brushing, 89.5% gave dietary advice, and 84% suggested that patients to use disclosing tablets. A fluoride rinse was recommended by 73% and a chlorhexidine mouthwash by 41.9% of orthodontists. Many orthodontists advocate appropriate oral hygiene measures, but the efficacy of such methods is determined by the patient's motivation. Therefore, orthodontists require skills in behavioral management.<sup>17</sup>

Repeated motivational sessions were demonstrated to the patients to all four groups.

Orthodontic toothbrush could be a better alternative to conventional toothbrush. Modified Bass Technique can be a better option than Vertical Brushing Technique as it concentrates the cleaning action on the cervical and interproximal part of the tooth, where the plaque is mostly accumulated.

#### **LIMITATION**

- Sample size was small.
- Duration of study was short.
- Microbial study would have given better results.

#### **CONCLUSION**

Orthodontic toothbrush could be a better alternative to conventional toothbrush. Modified Bass Technique can be a better option than Vertical Brushing Technique as it concentrates the cleaning action on the cervical and interproximal part of the tooth, where the plaque is mostly accumulated. Presence of brackets and wires decrease the efficacy of toothbrushing. The implementation of various motivational and educational therapy resulted in improvement of gingival and periodontal health. Within the limits of this study and based on the clinical significance of obtained results, it can be concluded that all 4 groups were effective in maintaining the oral hygiene of orthodontic patients, however it was suggested that Group 4 was more effective in these patients over a period of 1 month. Motivation of patients is essential to maintain good and fair oral hygiene status.

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