

## Comparison of efficacy of conventional toothbrush and single tuft brush for the control of dental plaque

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### Abstract

**Aim:** To compare the effectiveness of a Single Tuft Toothbrush (STB) with Conventional Toothbrush (CT) for the control of dental plaque. **Materials and Methods:** Chronic generalized gingivitis patients (n=25) were selected and received professional oral prophylaxis. All the subjects were reevaluated after 7 days and based on the periodontal evaluation (probing pocket depth and clinical attachment level), only periodontally healthy subjects (n=20) were included in the study. Subjects were randomly divided into 2 groups: STB group (n=20); CT group (n=20). Subjects were instructed to use only the assigned toothbrush for 72 hours with a 3-day washout period. The evaluated parameters were Gingival index (Loe and Silness, 1963), disclosed plaque index and modified sulcular bleeding index (Momblli, 1987) at baseline (T=0) and at the end of each experimental period (T=72).

**Results:** On intragroup comparison there was statistically significant difference in all the parameters in both groups at 72 hours (p<0.05). On intergroup comparison, statistically significant decrease in all the parameters were seen in ST group (p=0.00).

**Conclusion:** Single tuft brushes are more effective for control of dental plaque as compared to conventional toothbrush.

**Keywords:** Periodontally, Conventional toothbrush.

### Introduction

Dental plaque is the main etiologic agent in the development of dental caries and periodontal disease. Studies have stated that gingivitis may develop within two weeks without oral hygiene, and that early caries may be detected if the plaque is allowed to accumulate for more than 4 weeks.<sup>1</sup> Progression of gingivitis to periodontitis is accelerated by the imbalance in the bacterial community of the biofilm and the host, leading to the break in the homeostasis.<sup>2</sup> When this homeostasis is broken, visible changes such as spontaneous gingival bleeding, erythema, swelling and changes in gingival texture begin to emerge.<sup>3</sup> Setting up effective measures for the prevention of periodontitis require oral hygiene practices and consequently halting the dental biofilm formation.<sup>4</sup>

Mechanical plaque removal with toothbrushes remains the primary method of removing the plaque and debris from the tooth surfaces. In normal conditions, teeth cleaning solely with conventional toothbrush does not remove the biofilm effectively from all the surfaces.<sup>5</sup> Therefore, auxiliary devices, such as dental tapes, interproximal brushes and/or single tuft brushes are recommended for the thorough removal of the plaque for the specific areas. Generally, the interproximal surfaces and the lingual surfaces of mandible seem to have the most plaque formation. In subjects performing normal oral hygiene measures, buccal surface of the maxillary second molars showed significantly more plaque accumulation compared to that of the first molars, possibly due to the difficulty of cleansing accessibility.<sup>6</sup>

The use of single-tuft brushes (STB) is recommended for hard to reach areas such as buccal or lingual surfaces, crowded teeth, distal surfaces of molars, furcations and

proximal surfaces of the isolated teeth. Also, because of the uncomplicated direction of the STB towards the gingival margin, they may be advantageous for the removal of biofilm from deep pockets.<sup>6</sup> The aim of the present study was to compare the effectiveness of the single-tuft toothbrushes against the gold standard, conventional toothbrushes, at controlling the formation of dental biofilm in healthy individuals.

### Materials and Methods

#### Sample selection

Sample size was based on previously published studies of similar design<sup>7,8</sup> and consisted of 25 dental students. The inclusion criteria were: systemically and periodontally healthy subjects (probing depth  $\leq$  3 mm and no gingival bleeding),<sup>9,10</sup> aged between 18 and 30 years with a minimum of 20 remaining teeth, who agreed to participate in the study. Exclusion criteria were: presence of cervical restorations, antimicrobial therapy for any medical or dental condition within 6 months prior to the trial, use of drugs known to affect the periodontal environment (anti-inflammatories, pain-killers, contraceptives, anticonvulsants, immunosuppressants, cyclosporine, anticoagulants and calcium channel blockers) also within 6 months prior to the baseline periodontal examination, orthodontic treatment or device.

#### Study design

Two types of toothbrushes were compared: a single-tuft brush (TePe single tufted toothbrush) and a conventional toothbrush. The groups were defined as: STB- single tuft brushes, n=20; CT- conventional toothbrush (gold standard), n=20. During each experimental phase, the subjects were

instructed to use solely the toothbrush designated to their group, excluding any other additional cleaning strategy. Each experimental phase lasted 72 hours with a 3-day washout period in between, in order to avoid a possible residual effect of the previous toothbrush method.

### Clinical experimental phase

25 chronic generalized gingivitis students were selected for the study followed by professional oral prophylaxis. The patients were asked to retain their regular oral hygiene practice with a 7 day reevaluation phase. After 7 days, all the patients underwent periodontal examination which included probing pocket depth, gingival recession and clinical attachment level. 5 patients were excluded from the study as they were found to be periodontally unhealthy. Only the periodontally healthy patients (n=20) underwent a clinical oral examination performed by a single examiner, trained and calibrated to obtain the following initial clinical parameters: disclosed plaque index (DPI), gingival index (GI) and modified sulcular bleeding index (MSBI). Personalized instructions for toothbrushing were given individually and verbally according to the brush (STB). Only during the washout period, the subjects were encouraged to apply other conventional oral hygiene methods, such as dental floss or tape.

After 72 hours a second professional prophylaxis session was performed with a 3-day washout period. After the washout period, the volunteers were then assigned to the conventional toothbrush. GI, DPI and MSBI were recorded both at the beginning and at the end of each trial period.

### Statistical analysis

Only the subjects who completed the study (n=20) were considered for statistical purposes. For intra-group analysis (between periods) of the data (GI, DPI and MSBI), student's t test was used. For inter-group analysis (between treatments), student's t test was used. For all the analyzes, the significance level was set at 5%.

### Results

Intergroup analysis at the early experimental stage (T=0) revealed no statistically significant difference between both the treatments (STB, CT) for any of the evaluated parameters (DPI, GI, MSBI), demonstrating homogeneity between the groups. After 72 h (T=72) (Table 1), a significant difference was observed for all the parameters (p<0.05)

**Table 1:** Intergroup analysis at baseline and after 72 hours

Gingival index	Single tuft brush		Conventional tooth brush		t	p-value	95% Confidence Interval of the Difference	
	Mean	SD	Mean	SD			Lower	Upper
Baseline	1.16	0.06	1.17	0.09	0.400	0.691	-0.04	0.06
72 hours	1.10	0.04	1.13	0.07	1.617	0.114	-0.01	0.07
Modified sulcular bleeding index	Single tuft brush		Conventional tooth brush		t	p-value	95% Confidence Interval of the Difference	
	Mean	SD	Mean	SD			Lower	Upper
Baseline	1.19	0.11	1.19	0.11	0.000	1.000	-0.07	0.07
72 hours	1.12	0.09	1.15	0.10	1.013	0.318	-0.03	0.09
Plaque index	Single tuft brush		Conventional tooth brush		t	p-value	95% Confidence Interval of the Difference	
	Mean	SD	Mean	SD			Lower	Upper
Baseline	1.31	0.15	1.36	0.16	0.921	0.363	-0.05	0.14
72 hours	1.21	0.14	1.29	0.14	1.950	0.059	0.00	0.18
Difference	Single tuft brush		Conventional tooth brush		t	p-value	95% Confidence Interval of the Difference	
	Mean	SD	Mean	SD			Lower	Upper
Gingival index	0.07	0.06	0.04	0.09	-1.325	0.193	-0.08	0.02
Modified sulcular bleeding index	0.07	0.05	0.04	0.06	-1.790	0.081	-0.07	0.00
Plaque Index	0.11	0.05	0.06	0.05	-2.632	0.012	-0.08	-0.01

On intragroup comparison, the GI, MSBI, DPI showed improvement in both the groups at 72 hours. However, the improvement was statistically significant in the soft tuft brush as compared to the conventional brush. (Table 2a, 2b, 2c)

**Table 2a:** Intragroup comparison of Gingival index at baseline (T=0) and after 72 hours (T=72)

Gingival index	Single tuft brush	Conventional tooth brush
Baseline	1.16	1.17
72 hours	1.10	1.13

Mean Gingival index for the treatment at baseline (T=0) and after 72 hours (T=72) for single tuft and conventional toothbrush.

**Table 2b:** Intragroup comparison of modified gingival index at baseline (T=0) and after 72 hours (T=72)

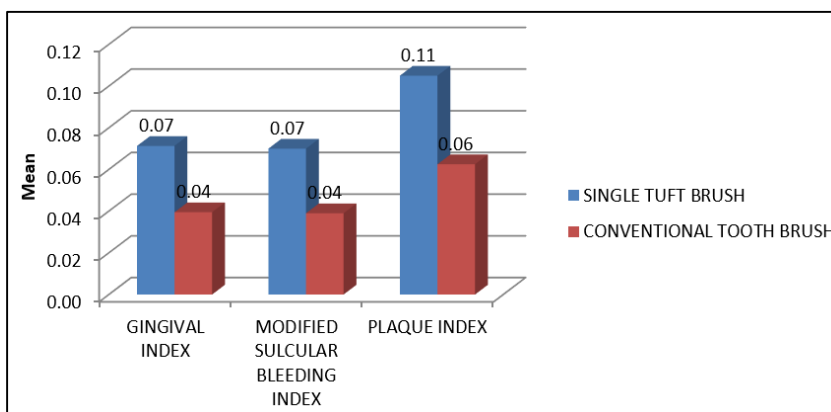
Modified sulcular bleeding index	Single tuft brush	Conventional tooth brush
Baseline	1.19	1.19
72 hours	1.12	1.15

Mean modified sulcular bleeding index for the treatment at baseline (T=0) and after 72 hours (T=72) for single-tuft and conventional toothbrushes.

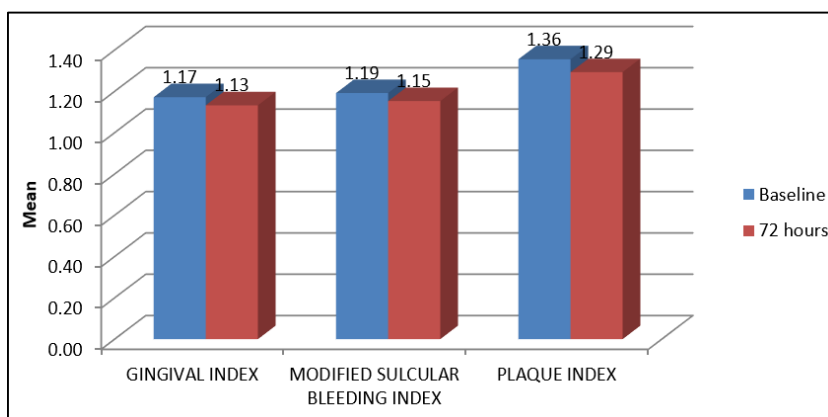
**Table 2c:** Intragroup comparison of disclosed plaque index at baseline (T=0) and after 72 hours (T=72)

Plaque index	Single tuft brush	Conventional tooth brush
Baseline	1.31	1.36
72 hours	1.21	1.29

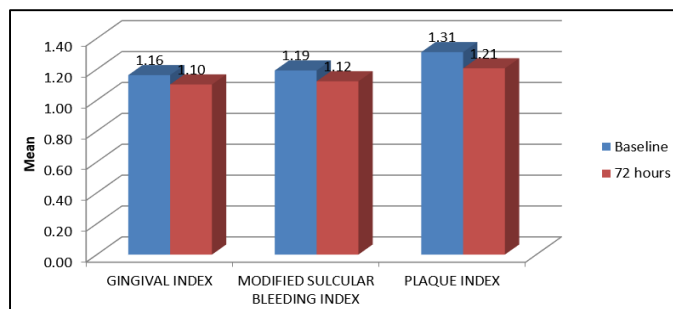
Mean disclosed plaque index for the treatment at baseline (T=0) and after 72 hours (T=72) for single tuft and conventional tooth brush



Comparative Mean of gingival index, disclosed plaque index and modified gingival index of the single tuft and conventional toothbrush.



Mean for the clinical parameters at baseline (T=0) and after 72 hours for conventional toothbrush



Mean for the clinical parameters at baseline (T=0) and after 72 hours for single tuft toothbrush

## Conclusion

The present study aimed at evaluating the efficacy of single tuft toothbrush in the removal of dental plaque from hard to reach surfaces. Tooth brushing per se is often insufficient to remove dental plaque particularly from interproximal and dentogingival areas. The inclusion of washout periods minimized the residual effects of the methods used before each new treatment.<sup>11-13</sup>

Rapp and coworkers<sup>14</sup> compared the Bass technique using single-tuft brush alone or in combination with dental flossing in interproximal areas. They concluded histomorphometrically, the Bass technique and the combination of single-tuft brushes with floss yielded very similar results and slightly better than the Bass-floss combination, while the use of single tuft brushes without dental flossing showed poorer results. The findings from Rapp et al do not correlate those from the present study.

In a randomized, single-blind, controlled clinical trial<sup>15</sup> performed with orthodontic patients, subjects wearing lingual fixed appliances were asked to brush with triple-head toothbrush or an orthodontic brush alone for one month. Subsequently, they were instructed to brush in conjunction with a single-tuft toothbrush for an additional one month. Professional oral prophylaxis was performed at baseline and one month later. Similar to the present study, a positive effect of the single tuft brush: when used alone, the triple-head brush seemed to remove dental plaque more efficiently than the orthodontic toothbrush.

In general, the present study was able to demonstrate the short-term effectiveness of single-tuft toothbrushes.

## Source of funding

None.

## Conflict of interest

None.

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