

2054. Gingival Margin Cleaning and Subgingival Access Efficacy of Three Toothbrushes

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Objectives

Two laboratory methods have been developed to measure the gingival margin and subgingival action of toothbrushes in these anatomical areas. The Gingival Margin Cleaning method (GMC) utilizes wet plaque-covered pressure-sensitive paper placed over simulated posterior teeth, to compare toothbrush products for their ability to remove artificial plaque at the junction of simulated gingival tissues. The second method Subgingival Access Efficacy (SAE) utilizes an artificial plaque-covered pressure-sensitive substrate to evaluate the ability of toothbrush bristles to penetrate below simulated gingival tissues around posterior tooth shapes and to remove artificial plaque under wet brushing conditions. The maximum depth of the plaque deposit removed is defined as subgingival access efficacy (SAE).

The purpose of these studies was to evaluate the Dr Best Zwischenzahn, Oral-B® CrossAction, and the Oral-B® Indicator toothbrushes for Gingival Margin Cleaning and Subgingival Access Efficacy.

Methods and Materials

The products tested in this assay were Dr Best Zwischenzahn, Oral-B® CrossAction 40 medium texture and Oral-B® Indicator medium texture. All toothbrushes were provided by GlaxoSmithKline Consumer Healthcare GmbH & Co. KG, Germany. Six products from each group were tested four times in each individual assay for a total of 24 evaluations. The laboratory equipment was fabricated to the design of Nygaard-Ostby, Edvardsen and Spydevold. Simulated gingivae were prepared from self-curing dental acrylic. The marginal anatomy was developed using dental textbook guidelines. The space between the acrylic gingivae and the tooth shapes was 0.2mm. The brushing technique was a horizontal brushing motion, simulated posterior teeth and an applied brushing weight of 500 g.

Gingival Margin Cleaning: The tooth brushing technique involved independent evaluations of each toothbrush in a horizontal brushing motion, tooth shapes simulating posterior teeth and a brushing weight of 500g. The toothbrush to be tested was aligned with the papillae of the gingival margin and the brushing apparatus was set to brush for 60 seconds at two strokes per second with a 15mm stroke. For cleaning at the gingival margin (GMC), the length of the artificial plaque deposit removed was recorded at the junction of the simulated gingivae and pressure-sensitive paper. Readings were measured in mm with 3x magnification by one investigator. The data were analyzed using t-tests for statistical significance between the three groups, assuming unequal variances.

Subgingival Access: Each toothbrush to be tested was aligned with the papillae of the gingival margin, and the brushing apparatus was set to brush for 30 seconds at two strokes per second with a 15 mm stroke length. The maximum depth of the plaque deposit removed (SAE) was recorded on a artificial plaque-covered substrate placed under the simulated gingivae and around the posterior-shaped teeth. Readings were measured in millimeter units with 3x magnification by one investigator. Descriptive statistics (mean and standard deviation) were calculated for the toothbrushes tested. A comparison of mean SAE was conducted using two-sample t-tests assuming unequal variances.

Figure 1 Side and facial view of the tested toothbrushes



Results

The Dr Best Zwischenzahn toothbrush is statistically superior ($p < 0.001$) compared to the Oral-B® CrossAction and the Oral-B® Indicator toothbrushes in GMC and SAE.

Table 1 Gingival margin cleaning on anterior or posterior shaped teeth with horizontal brushing

Gingival Margin Cleaning Toothbrush	Mean (SD) mm
Dr Best Zwischenzahn	9.6 (1.1)
Oral-B® CrossAction	4.5 (3.1)
Oral-B® Indicator	1.4 (1.6)

Figure 2 Gingival Margin Cleaning on anterior or posterior teeth with horizontal brushing

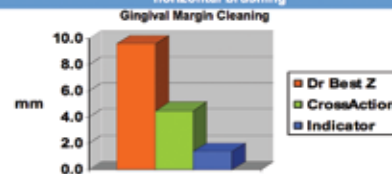
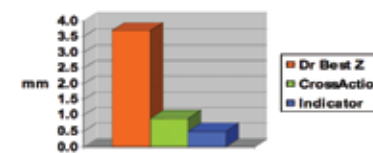


Table 2 Subgingival Access Efficacy

Subgingival Access Efficacy Toothbrush	Mean (SD) mm
Dr Best Zwischenzahn	3.7 (0.5)
Oral-B® CrossAction	0.9 (0.5)
Oral-B® Indicator	0.5 (1.4)

Figure 3 Subgingival Access Efficacy



Conclusions

Laboratory studies were conducted to evaluate cleaning efficacy at the gingival margin (GMC) and the depth of artificial plaque removed below the gingival margin (SAE) between three toothbrush products. In these laboratory studies, the Dr Best Zwischenzahn toothbrush is significantly ($p < 0.001$) more effective for the gingival margin cleaning and subgingival access efficacy compared to Oral-B® CrossAction and the Oral-B® Indicator toothbrush products tested. The Oral-B® CrossAction has a significantly ($p < 0.001$) higher GMC mean than the Oral-B® Indicator. There is no statistical difference ($p < 0.05$) between the SAE mean of the Oral-B® CrossAction toothbrush and the Oral-B® Indicator toothbrush.

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