

# **Final Report**

**Andy Kossowsky  
Vertex Toothbrush, L.L.C.  
Irvington, N.Y.**

## **Interproximal Access Efficacy of the Vertex and Oral-B Indicator P35 Soft Texture Toothbrushes**

**S. L. Yankell, X. Shi, C. M. Spigel  
YRC Inc.  
Moorestown, NJ USA**

**May 18, 2018**

## **Abstract**

Two commercially available soft texture toothbrushes, Vertex and Oral-B Indicator P35, were evaluated for interproximal access efficacy (IAE) and plaque removal using an artificial-plaque-covered, pressure-sensitive substrate placed around simulated anterior and posterior teeth, using both horizontal and vertical brushing motions. Twenty-four tests on each toothbrush group were conducted. Results for all brushing comparisons were statistically analyzed using t-tests assuming unequal variances. When results for the individual assays are combined to assess overall performance, the IAE mean for the Vertex toothbrush is superior to the overall mean for the Oral-B Indicator P35 toothbrush ( $p < .001$ ). There were no splayed bristles or other apparent changes in appearance for any of the toothbrushes tested in this study.

## **Introduction**

Since 1983, a principal method in our laboratory assesses the ability of toothbrush bristles to penetrate between simulated teeth and remove artificial plaque.<sup>1</sup> Efficacy in this assay is termed Interproximal Access Efficacy (IAE). Products are evaluated in both vertical and horizontal brushing motions on anterior and posterior tooth shapes. These values are then combined to determine an overall efficacy of the toothbrush products which has been correlated with clinical plaque removal.<sup>1-26</sup> The purpose of this study was to evaluate two soft texture toothbrushes, Vertex and the Oral-B Indicator P35, for efficacy in the IAE assay.

## Materials and Methods

The Vertex and the Oral-B Indicator P35 (distributed by Oral-B, a division of Procter & Gamble, Cincinnati, OH), were evaluated for Interproximal Access Efficacy. Photographs of the products tested are shown in the Addendum to this report. All products were provided by the sponsor. Six toothbrushes from each product group were tested four times for a total of 24 tests. All products were stored in the laboratory at a temperature of 67-70 °F for more than 24 hours before testing. The laboratory method and device developed by Nygaard-Ostby, Edvardsen and Spydevold<sup>2</sup> utilizes independent evaluations of each toothbrush design in vertical and horizontal brushing motions on tooth shapes simulating anterior and posterior teeth. The laboratory device was modified to the design of Shi, Emling and Yankell<sup>27</sup> to affix toothbrushes by the handle. The device was set to brush 15 seconds at two strokes per second with a 50-mm stroke and a brushing weight of 250g. The artificial plaque substrate<sup>27</sup> placed around the teeth was hydrated with room temperature tap water for 15 seconds prior to the start of brushing and the toothbrush bristles and plaque substrate were sprayed with water during brushing. After brushing was completed, the plaque substrate was removed and dried, and the maximum width (Interproximal Access Efficacy - IAE) of the plaque removed was recorded in cm under 3X magnification using Vernier calipers. All toothbrushes tested were visually examined before and after the completion of each brushing cycle for bristle integrity. The same examiner performed all evaluations. Descriptive statistics (mean and standard deviation) were calculated, and significant differences between mean IAE were identified using a t-test, assuming unequal variances.

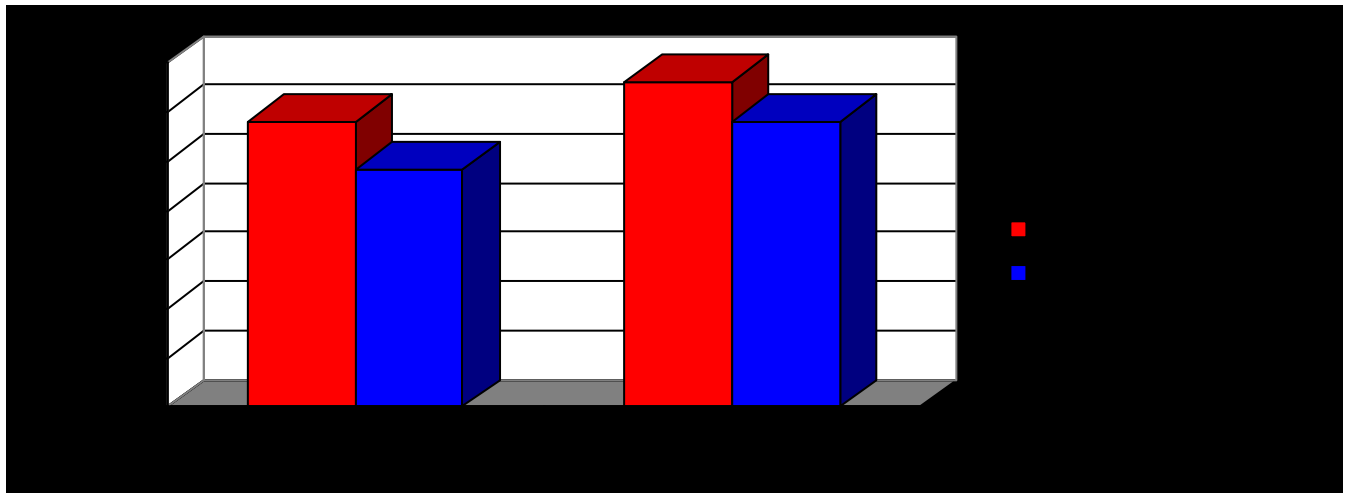
## Results

IAE results with vertical brushing are presented in Table I and Figure 1.

**Table I**  
**Interproximal Access Efficacy on Anterior and Posterior Shaped Teeth with Vertical Brushing**

<u>Tooth Shape</u>	Mean,cm (SD)	
	<u>Vertex</u>	<u>Oral-B Indicator P35</u>
Anterior	1.16 (0.06)	0.97 (0.06)
Posterior	1.32 (0.04)	1.16 (0.02)

**Figure 1**  
**Vertical Brushing**



The IAE means on anterior and posterior tooth shapes with vertical brushing are statistically higher for the Vertex product than the Oral-B Indicator toothbrush ( $p < .001$ ).

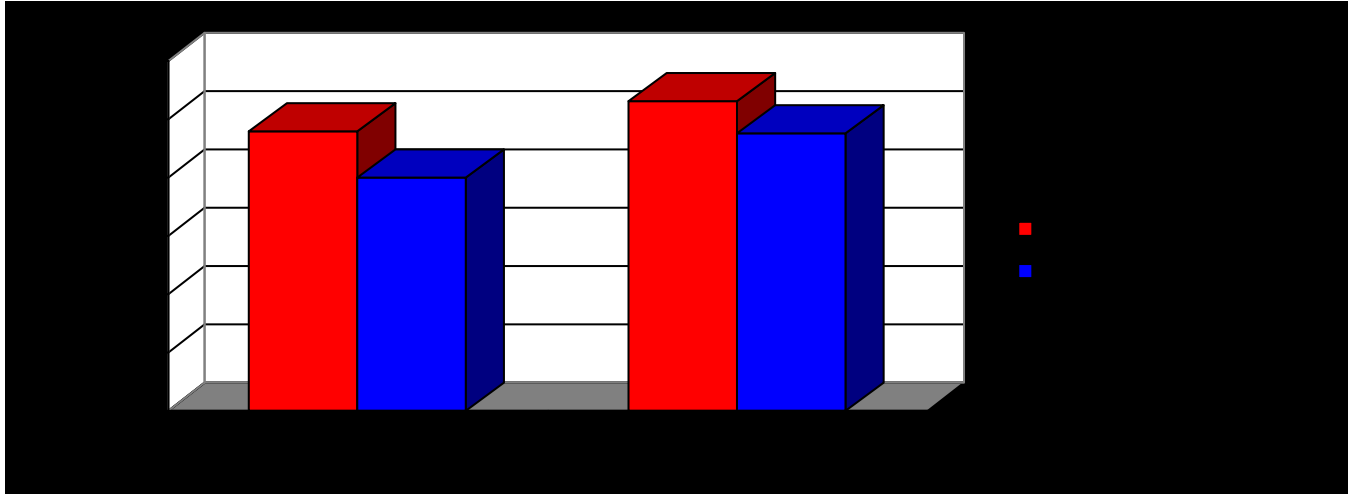
IAE results using horizontal brushing are presented in Table II and Figure 2.

**Table II**

**Interproximal Access Efficacy on Anterior and Posterior Shaped Teeth with Horizontal Brushing**

<u>Tooth Shape</u>	<u>Vertex</u>	<u>Oral-B Indicator P35</u>
	Mean,cm (SD)	
Anterior	0.96 (0.05)	0.80 (0.05)
Posterior	1.06 (0.07)	0.95 (0.12)

**Figure 2**  
**Horizontal Brushing**



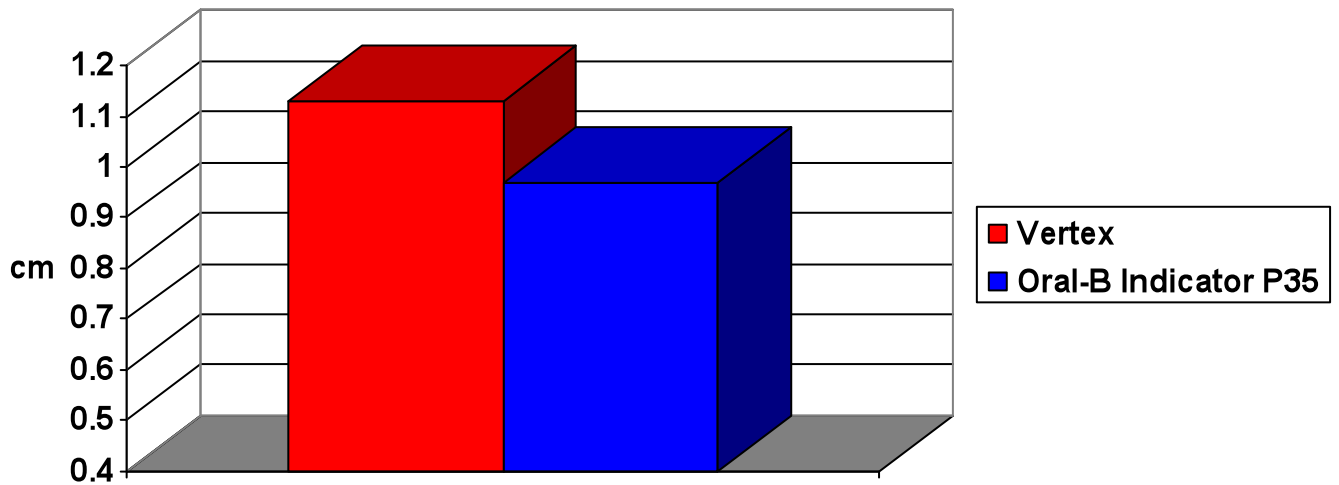
On both anterior and posterior shaped teeth with horizontal brushing, the Vertex toothbrush has statistically higher mean IAE than the Oral-B Indicator ( $p < .001$ ).

Overall results combining IAE data using vertical and horizontal brushing motions and anterior and posterior tooth shapes are shown in Table III and Figure 3.

**Table III**  
**Overall Interproximal Access Efficacy**

<u>Vertex</u>	<u>Oral-B Indicator P35</u>
Mean,cm (SD)	
1.13 (0.14)	0.97 (0.15)

**Figure 3**  
**Overall IAE Means**



The overall IAE mean for the Vertex toothbrush is statistically higher than the IAE mean for the Oral-B Indicator P35 toothbrush ( $p < .001$ ). Throughout all of the studies conducted, there were no splayed bristles or other apparent changes in appearance for any of the toothbrushes.

## References

1. Yankell SL, Nygaard-Ostby P: Evaluating cleaning efficiency of different toothbrush designs and textures. *J Soc Cosmet Chem* 34:151-157, 1983.
2. Nygaard-Ostby P, Edvardsen S, Spydevold B: Access to interproximal tooth surfaces by different bristle designs and stiffnesses of toothbrushes. *Scand J Dent Res* 7: 424-430, 1979.
3. Yankell SL, Green PA, Greco PM, Stoller NH, Miller MF: Test procedures and scoring criteria to evaluate toothbrush effectiveness. *Clin Prev Dent* 6: 3-8, 1984.
4. Bergenholtz A, Gufstafsson LB, Segerlund N, Hagberg C, Nygaard-Ostby P: Role of brushing technique and toothbrush design in plaque removal. *Scand J Dent Res* 92:344-351, 1984
5. Volpe AR, Emling RC, Yankell SL: The toothbrush - a new dimension in design, engineering and clinical evaluation. *J Clin Dent* 3:C29-C33, 1992.
6. Yankell SL, Shi X, Emling RC: Comparative laboratory evaluations of three toothbrushes regarding interproximal access efficacy. *J Clin Dent* 3: C5-C8, 1992.
7. Sharma NC, Galustians J, Rustogi KN, McCool JJ, Petrone M, Volpe AR, Korn LR, Petrone D: Comparative plaque removal efficacy of three toothbrushes in two independent clinical studies. *J Clin Dent* 3: C13-C20, 1992.
8. Singh SM, Rustogi KN, McCool JJ, Petrone M, Volpe AR, Korn LR, Petrone D. Comparative plaque removal efficacy of three toothbrushes in two independent clinical studies. *J Clin Dent* 3: C21-C28, 1992.
9. Yankell SL, Shi X, Emling RC: Comparative laboratory evaluations of two toothbrushes regarding interproximal access efficacy. *J Clin Dent* 4: D1-D4, 1993.
10. Balanyk TE, Sharma NC, Galustians J: A clinical study of comparative plaque removal performance of two manual toothbrushes. *J Clin Dent* 4: D8-D12, 1993.
11. Singh SM, Deasy MJ: Clinical plaque removal performance of two manual toothbrushes. *J Clin Dent* 4: D13-D16, 1993.
12. Deasy MJ, Singh SM, Kemp JH, Curtis JP, Rustogi KN, Fung K: A clinical comparison of plaque removal performance of three manual toothbrushes. *J Clin Dent* 4: D17-D21, 1993.
13. Yankell SL, Shi X, Emling RC: Laboratory evaluations of two toothbrushes for removal of artificial plaque above, around and below the gingival margin. *J Clin Dent* 14: 19-22 2003.
14. Sgan-Cohen HD, Vered Y: Plaque removal and oral health promotion potential for the elmex interX medium toothbrush: clinical efficacy and safety evaluation. *J Clin Dent* 14: 70-73, 2003.
15. Dorfer CE, von Bethlenfalvy ER, Hugel B, Pioch T: Cleaning efficacy of a manual toothbrush with tapered filaments. *Oral Health Prev Dent* 1:111-118, 2003.
16. Mankodi S, Wachs GN, Petrone DM, Chaknis P, Petrone M, DeVizio W, Volpe AR: Comparison of the clinical efficacy of a new manual toothbrush on gingivitis reduction and plaque removal. *Compend Contin Educ Dent* 25, Suppl 2: 28-36, 2004
17. Nathoo S, Chaknis P, Petrone M, DeVizio W, Volpe AR: A clinical comparison of gingivitis reduction and plaque-removal efficacy of a new manual toothbrush. *Compend Contin Educ Dent* 25, Suppl 2: 37-45, 2004.
18. Sgan-Cohen HD, Vered Y: A clinical trial of the Meridol toothbrush with conical filaments: Evaluation of clinical effectiveness and subjective satisfaction. *J Clin Dent* 16: 109-113, 2005.
19. Yankell SL, Shi X, Emling RC: Laboratory interproximal access efficacy and gingival margin cleaning of the elmex sensitive , extra and ADA toothbrushes. *J Clin Dent* 18: 25-28, 2007.
20. Singh S, Rustogi KN, Chaknis P, Petrone ME, DeVizio W, Proskin HM: Comparative efficacy of a new battery-powered toothbrush and a commercially available manual toothbrush on the removal of established plaque: a single-use crossover study in adults. *J Clin Dent* 16:57-61, 2005.
21. Sgan-Cohen HD, Livny A, Vered Y: The elmex Sensitive toothbrush: Effect on plaque reduction and subjective satisfaction after two months. *J Clin Dent* 19: 22-27, 2008.

22. Sowinski J, Petrone DM, Wachs GN, Chaknia P, Kemp J, Sprosa AA, DeVizio W: Efficacy of three toothbrushes on established gingivitis and plaque. *Am J Dent* 21: 339-345, 2008.
23. Barnes CM, Covey DA, Shi X, Yankell SL: Laboratory evaluations of a bi-level extremely tapered bristled toothbrush and a conventional uniform bristled toothbrush. *Am J Dent* 22: 84-88, 2009.
24. Yankell SL, Barnes CM, Shi X, Cwik J: Laboratory efficacy of three compact toothbrushes to reduce artificial plaque in hard to reach areas. *Am J Dent* 24: 195-199, 2011.
25. Kemp JH, Barnes CM, Spigel CM, Shi X, Yankell SL: laboratory evaluation of plaque removal at interproximal sites by a specially engineered powered toothbrush with unique sensing and control technologies. *J Clin Dent* 23: A17-A20, 2012
26. Nathoo S, Mankodi S, Mateo LR, Chaknis P, Pananakos F: A clinical study comparing the supragingival plaque and gingivitis efficacy of a specially engineered sonic powered toothbrush with unique sensing and control technologies to a commercially available manual flat-trim toothbrush. *J Clin Dent* 23: A11-A16, 2012
27. Shi X, Emling RC, Yankell SL. A new laboratory method for in vitro evaluation of the interproximal penetration of manual toothbrushes. *J Dent Res* 74:49, 1995.



## Addendum

### Facial View of the Toothbrush Heads



Toothbrushes, left to right: Vertex, Oral-B Indicator P35

### Lateral View of the Toothbrush Heads



Toothbrushes, left to right: Vertex, Oral-B Indicator P35