

Gingival Margin Cleaning and Interproximal Access Efficacy of Six Toothbrushes

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Aims

- Plaque removal via mechanical toothbrushing is the foundation of control of dental conditions including periodontitis, gingivitis and caries^{1,2}
- This *in vitro* study utilised simulated teeth to evaluate plaque removal efficacy of six toothbrushes at the gingival margin – using a measure of Gingival Margin Cleaning³ (GMC) – and between teeth – using a measure of Interproximal Access Efficacy (IAE)

Methods

- Five marketed toothbrushes, with a flexible ball joint bend in the neck and differing bristle arrangement, plus a reference toothbrush (GSK Consumer Healthcare, Brentford, UK) were tested using automated tests of GMC³ and IAE⁴ to examine *in-vitro* brushing efficacy



Toothbrush A
(‘soft’ brush)



Toothbrush B
(‘soft’ brush)



Toothbrush C
(‘soft’ brush)



Toothbrush D
(‘medium’ brush)



Toothbrush E
(‘soft’ brush)

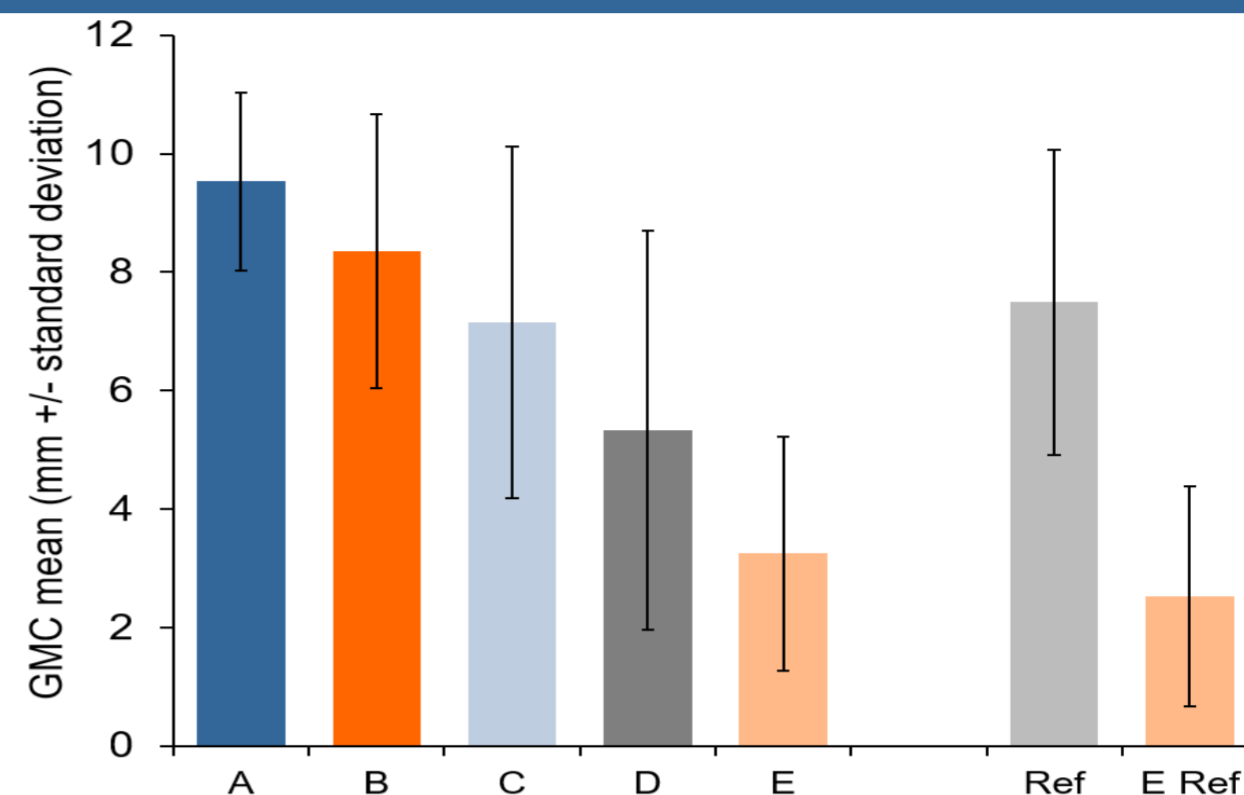


Reference toothbrush
(soft brush)

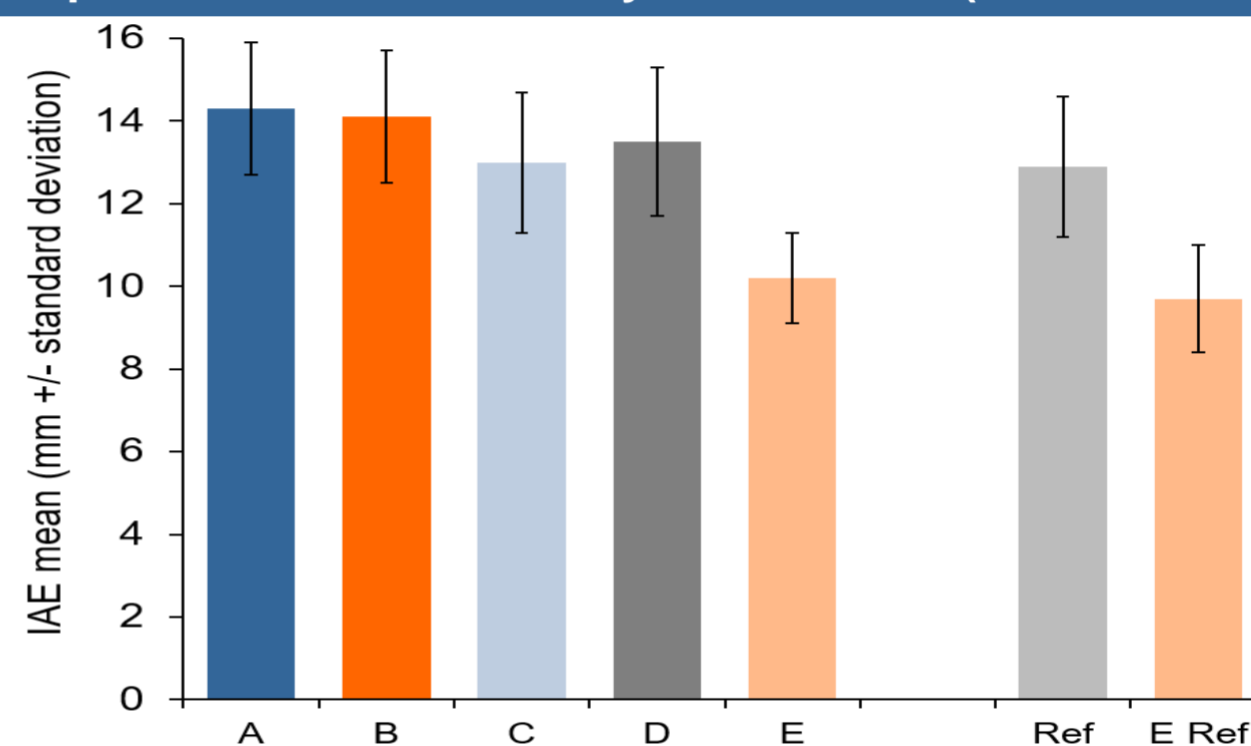
- A standardised artificial plaque-covered, pressure sensitive substrate was placed under simulated gingivae positioned around simulated posterior (GMC/IAE) or anterior (IAE) teeth
 - Hydrated with room temperature water for 15 s prior to brushing, brush head hydrated throughout brushing
- Brushing protocol
 - 15 seconds each run; two strokes/second; 15mm (GMC) or 50mm (IAE) stroke length; horizontal (GMC/IAE) or vertical (IAE) brushing motions; bristles 90° to tooth surface; 250g brushing weight
 - Toothbrushes gingival margin-aligned for GMC, tooth-aligned for IAE
 - For each test, six of each toothbrush type was tested, four times each
 - Toothbrush E was tested separately with its own Reference (E Ref)
- Measurements
 - GMC: length of plaque deposit removed at gingival margin junction
 - IAE: maximum width of plaque removed
 - Recorded at 3x magnification using Vernier callipers; in mm (GMC) or cm (IAE, converted to mm for consistency of results presentation)
- Results for brushing comparisons (except Toothbrush B) were analysed by analysis of variance (vertical/horizontal brushing as fixed effects) and Tukey's test for multiple pairwise comparisons (significance level .05)
 - Toothbrush B means were compared to a separate Reference batch (E Ref) using a t-test assuming unequal variances

Results

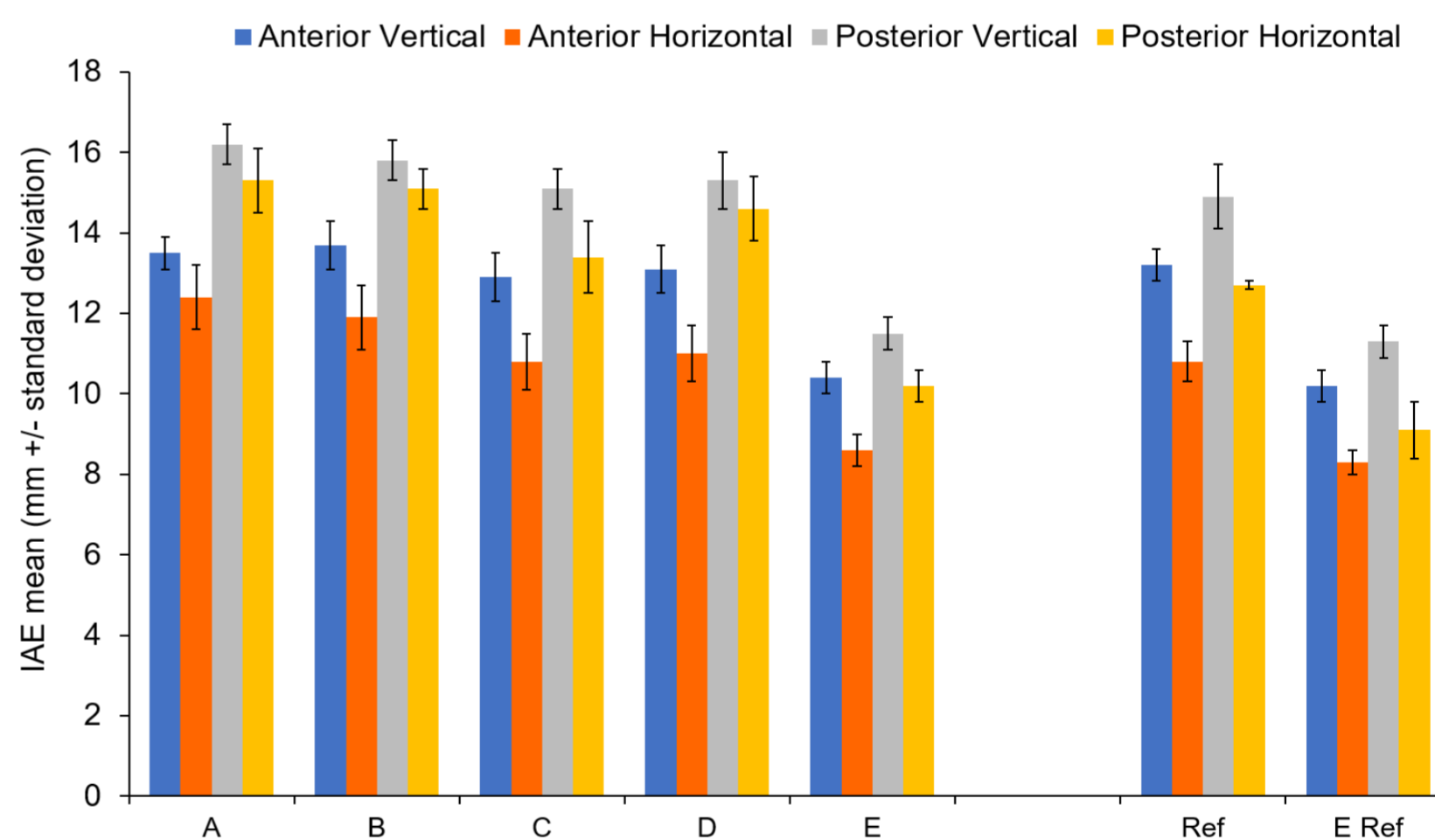
Gingival Margin Cleaning mean (+/- standard deviation)



Interproximal Access Efficacy overall mean (+/- standard deviation)



Interproximal Access Efficacy mean (+/- standard deviation) by tooth shape (anterior or posterior) and brushing movement (vertical or horizontal)



- All test toothbrushes were statistically superior compared to the Reference toothbrush (GMC $p < .05$; IAE overall means $p < 0.001$)

Conclusions

- Gingival margin cleaning and interproximal access efficacy can be enhanced by bristle designs that target gingival and interproximal areas

References

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