Removal of Simulated Organic Dental Plaque by Different Interdental Brushes

T. LANG*, K. W. WEICH and P. GAENGLER
ORMED - Institute for Oral Medicine at the University of Witten/Herdecke, Germany
EMail: info@ormed.net, web: www.ormed.net

Objectives:
Intestinal plaque control plays an important role in oral hygiene of adults. Therefore, it was the aim to test ex-vivo the cleaning efficiency of (i) an experimental interdental toothbrush in comparison with (ii) different interdental brushes and (iii) a dental flosser and (iv) a manual toothbrush using organic plaque simulation (Flad at al., 2016) in a planimetrical assessment approach.

Material and Methods:
Plaque removal efficacy at interdental planimetric risk fields by three interdental brushes IDB-A: TePe size 2, parallel (Malmö, Sweden); IDB-B: DenTek Easy Brush ISO-2; conical (Terrytown, USA); IDB-C: experimental, helicoidal; and the Efiseptyl dental flosser IDB-Flosser (Paris, France) and MTB: Dr-Best manual toothbrush (GlaxoSmithKline, Bühl, Germany) was assessed. Eleven typeodont teeth in anatomical position with gingival mask (KalVo, Biberach, Germany) were covered with artificial organic plaque exhibiting oral-physiologic parameters similar to natural plaque. Interdental spaces were cleaned with 4 strokes (2 x straight, 1 x 30° mesially, 1 x 30° distally) with interdental brushes and 5 strokes (1 x below contact point, 2x mesially, 2 x distally) with the dental flosser. Manual toothbrush was tested with horizontal brushing movement. The brushing force was calibrated to 3.5 N. All tests were executed seven times (n=7).

The percentage of plaque removal at 24 planimetrical crown fields and 6 root fields at 4 sites per tooth was documented by computer-assisted optical planimetry (APP, Fig. 2). Cleaning efficacy at single teeth and selected planimetrical fields was statistically compared (t-Test, Wilcoxon-Mann-Whitney-Test).

Results:
IDB Helix and IDB Dentek exhibit the best cleaning efficacy at all interdental surfaces at incisors, canines, premolars and molars with no statistical differences between the two IDB’s. Both IDB’s clean the risk fields next to the gum line better compared to the IDB TePe and to the Flosser. Because of the brushing action the manual toothbrush removes the most simulated plaque from the risk fields next to gum line. The design of IDB is decisive for the statistically significant, very significant and highly significant differences in the biophysically brushing action of parallel brush heads, conical brush heads and helicoidal brush heads. The flossing action is at interdental risk fields less efficient.

Conclusions:
The new ex-vivo test methodology of interdental brushes compared to flossing and manual toothbrushing is highly standardized, and the planimetrical plaque removal outcome at four sites of teeth in anatomical position results in precise efficacy values. Different designs of interdental brushes are decisive for their efficacy.
Flossing is less effective in interdental plaque removal compared to conical and helicoidal brushes. The superior plaque removal at risk fields next to the gum line by manual toothbrushing is supporting combined usage with interdental brushes. Prevention of gum diseases and root caries needs further research of the best design, whereas flossing could be avoided.