Plaque Reduction and Inflammation Control with a Ultrasonic Toothbrush

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OBJECTIVES

- The two major bacterial diseases of the oral cavity are dental caries and periodontal diseases.

- Most important tool of prevention: personal oral hygiene using toothbrushes and fluoride containing dentifrices.

- Long-lasting use of abrasive brushes and pastes can result in combined erosive-abrasive lesions of teeth and gums.

AIM

- To evaluate alternative bio-physical methods for non-abrasive reduction of bacterial biofilms on teeth.

- To assess plaque reduction and inflammation control with the Ultrasonic Toothbrush emmi®-dental Professional (EMAG Technologies®, Mörfelden-Walldorf, Germany) compared to low abrasive tooth cleaning tablets Denttabs® (Innovative Zahnpflegegesellschaft mbH, Berlin, Germany).

Ultrasonic Toothbrush emmi®-dental Professional with special toothpaste (EMAG Technologies®)

Denttabs® Tooth cleaning tablets based on micro crystaline cellulose (Innovative Zahnpflegegesellschaft mbH)

Soft tapered filaments



Manual Toothbrush Denttabs® (Innovative Zahnpflegegesellschaft mbH)

METHODS

- 16 healthy subjects aged 20-34 years with at least 26-28 teeth, except the third molars

- Cross-over study design: 2x 28 days

- Professional meticulous tooth cleaning prior to the study

- Four-day-training with the assigned toothbrush

- Three-day-plaque-regrowth

- Modified Navy-Plaque-Index (Lang et al. 2011), intraoral planimetric photography at baseline, after three minutes supervised brushing, and after seven and 21 days

- Löe and Silness gingival index (GI) was recorded at baseline, after seven and 21 days

- Eight days wash-out period

- Statistical analysis by t-test or Wilcoxon signed-rank test

- Ethical commitee approval number 35/2010
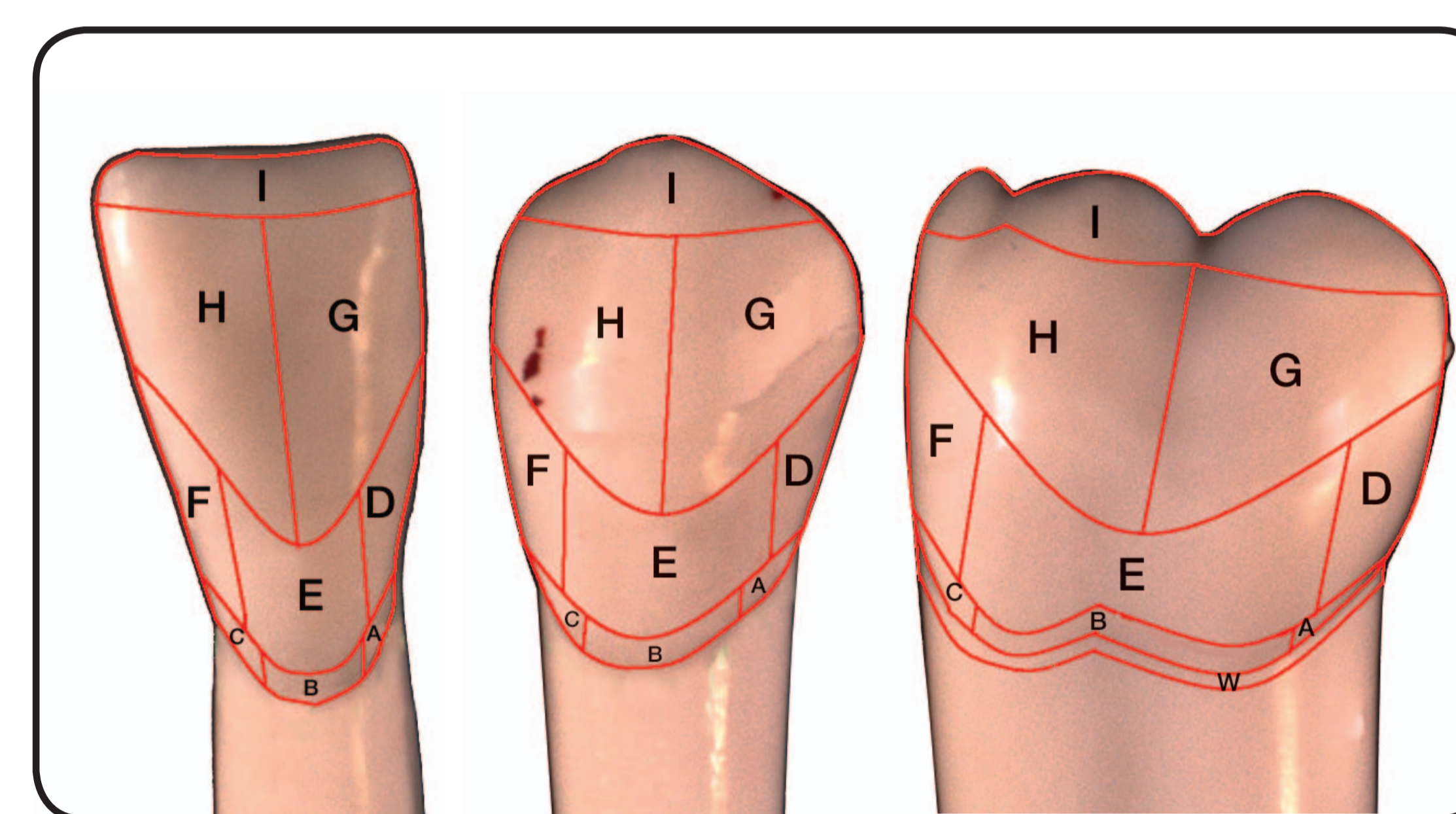
The modified Navy-Plaque-Index (Claydon and Addy 1995) according to Lang et al. (2011), planimetric fields A to I on the buccal and lingual surfaces (nine planimetric fields, code of plaque coating 0-2)

Intraoral planimetric photography



After 3-day-plaque-regrowth at baseline

After 3 minutes supervised brushing

RESULTS and DISCUSSION

- The emmi®- dental Professional ultrasonic toothbrush demonstrated in comparison with the manual toothbrush Denttabs® an equally well pronounced reduction of plaque after four training days and three-day plaque-regrowth period in all 16 subjects.

- The plaque reduction on all sites of teeth after one single tooth-brushing was more than 20% compared to non-cleaned teeth.

- The area free of plaque was kept by 45% during follow-up for seven and 21 days.

- The plaque reduction with both brushes was better at the front teeth compared to the posterior teeth.

- Maxillary and mandibular teeth were equally well cleaned.

- The assessment of plaque control along the gum line and between the teeth demonstrated a clear reduction of plaque.

- Extremely low scores of GI over the whole study period for both toothbrushes indicated that most sites were free of inflammation.

- Unique results of an exclusively ultrasound activated powered toothbrush. According to the Cochrane Reviews of 2005 and 2010 ultrasonic toothbrushes tested so far were combined sound/ultrasound models.

- Most important advantage: non abrasive movement over the tooth groups to exclude any abrasive risk for teeth and gums when in permanent use.

Individual assessment of Gingival Index
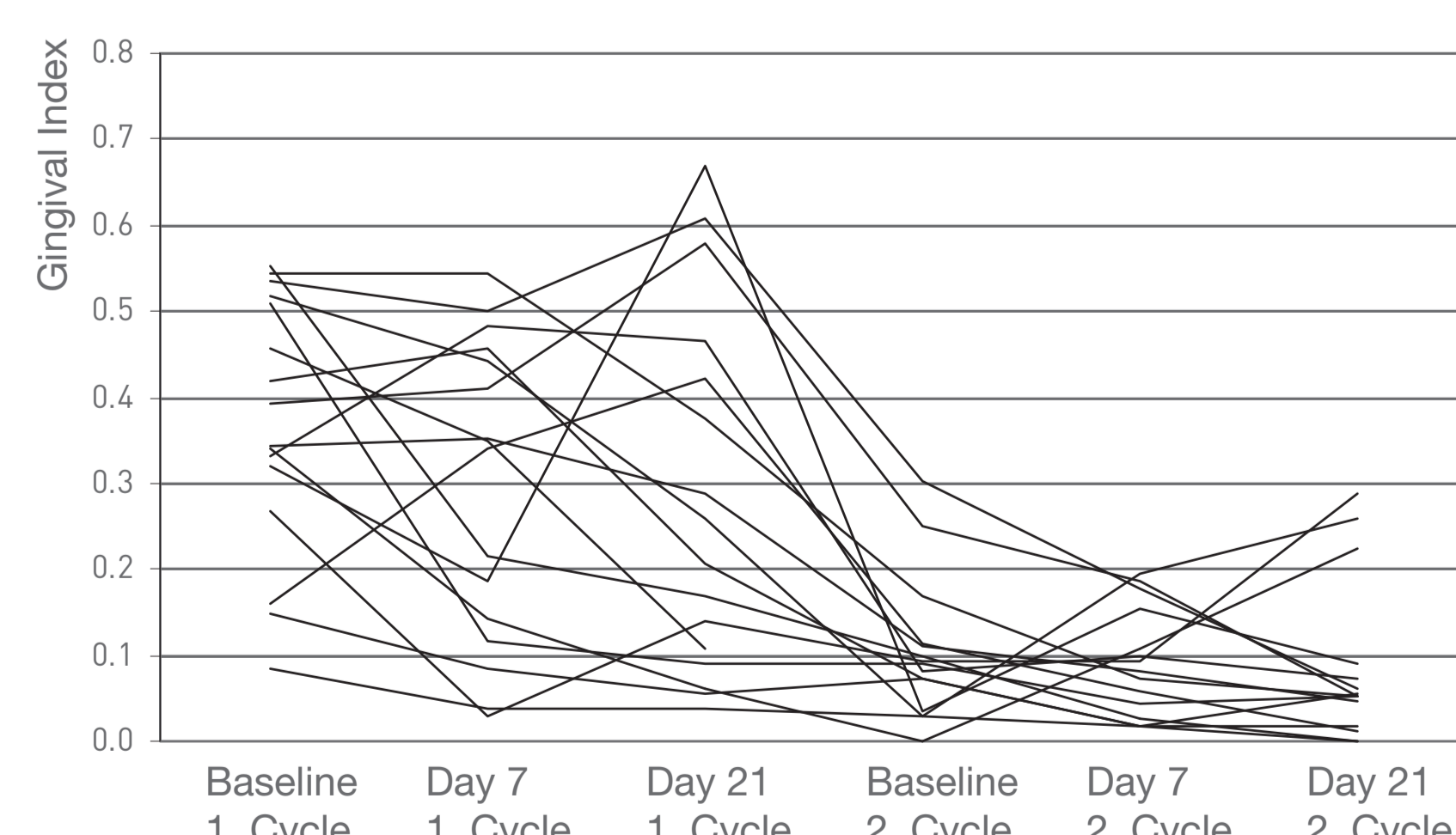
The individual assessment demonstrates a rather higher difference at the start of the study, decreasing during the second cycle (Hawthorne effect)

Inflammation control by Gingival Index

Time	Site	Min.	Median	Max.	p-Value
Baseline	Oral	0.00	0.00	0.33	
	Buccal	0.00	0.19	0.73	
	Δ oral-buccal	-0.73	-0.15	0.06	<0.0001*
7 Days	Oral	0.00	0.00	0.18	
	Buccal	0.02	0.17	0.70	
	Δ oral-buccal	-0.67	-0.15	-0.02	<0.0001*
21 Days	Oral	0.00	0.00	0.29	
	Buccal	0.00	0.12	0.89	
	Δ oral-buccal	-0.89	-0.12	0.01	<0.0001*

*p-Value of paired t-test

Planimetric plaque reduction (buccal sites)

Time	Method	Min.	Median	Max.	p-Value
Prebrush	Ultrasonic	0.94	1.50	1.77	
	Manual	0.88	1.43	1.68	
	Δ man.-US	-0.60	-0.07	0.22	0.038*
Postbrush	Ultrasonic	0.65	1.10	1.59	
	Manual	0.27	0.84	1.54	
	Δ man.-US	-0.77	-0.28	0.48	0.014*
7 Days	Ultrasonic	0.68	1.34	1.68	
	Manual	0.42	1.08	1.75	
	Δ man.-US	-0.77	-0.21	0.30	0.014*
21 Days	Ultrasonic	0.56	1.27	1.71	
	Manual	0.52	1.11	1.38	
	Δ man.-US	-0.62	-0.10	0.14	0.010*

*p-Value of paired t-test

Planimetric plaque reduction (oral sites)

Time	Method	Min.	Median	Max.	p-Value
Prebrush	Ultrasonic	0.58	1.02	1.54	
	Manual	0.68	1.11	1.29	
	Δ man.-US	-0.42	0.02	0.29	0.679*
Postbrush	Ultrasonic	0.60	0.93	1.46	
	Manual	0.42	0.93	1.31	
	Δ man.-US	-0.70	0.00	0.33	0.376*
7 Days	Ultrasonic	0.92	1.17	1.57	
	Manual	0.47	1.13	1.44	
	Δ man.-US	-0.50	-0.11	0.12	0.017*
21 Days	Ultrasonic	0.96	1.15	1.55	
	Manual	0.80	1.14	1.52	
	Δ man.-US	-0.30	-0.01	0.55	0.624**

*p-Value of paired t-test
**p-Value of Wilcoxon signed-rank test

CONCLUSIONS

➡ The tested exclusively ultrasound-activated toothbrush emmi®-dental Professional is as effective in plaque reduction as a manual toothbrush.

➡ The ultrasonic toothbrush contributes to gingival health and avoids completely abrasive brush movements.

➡ The risk of abrasive lesions on teeth and gums is excluded.