

Planimetric plaque assessment of toothbrushing with agents of different abrasivity

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Objectives:

Oral hygiene gels in nursing contribute to maintain healthy conditions. It was therefore, the aim (i) to assess plaque reduction by toothbrushing with a non-abrasive experimental gel formulation and (ii) to compare with low-abrasive oral hygiene tablets and high-abrasive dentifrice in a randomized clinically controlled cross-over study.

Material and Methods:

After ethical approval calibrated subjects (24) were trained by video sequences in-office and at home concerning brushing movements 5 s each horizontal, rotating and vertical with force of 3.43 N. After meticulous professional plaque removal 3-day-plaque regrowth started. Baseline data were assessed by modified planimetric Claydon/ Addy Plaque Index (Lang et al. 2011) using intra-oral photographs of 20-24 teeth with 9 planimetric fields per lingual and per buccal sites. Code 0 - no plaque, Code 1 < 50 %, Code 2 > 50 % of planimetric field covered with plaque. Subjects brushed their teeth supervised under video control with the ADA reference toothbrush and the experimental oral hygiene gel containing chitosan and fluoride, with Denttabs oral hygiene tablets (Innovative Zahnpflegegesellschaft, Berlin, Germany) or Crest Pro-Health Whitening (Procter&Gamble, Ohio, USA) for 2 min. All pre-brush and post-brush planimetric fields were assessed as well as risk fields next to the gumline and interproximally and statistically compared using t-test and Wilcoxon-test ($p=0.05$).

Results:

The plaque removal efficacy ranged from 15.07% to 89.27% in all planimetric fields and was more effective in risk fields next to the gumline and interproximally comparing the differences of plaque scores (Delta PI) at baseline (pre-brush) and after supervised brushing (post-brush). This cleaning percentage was in most buccal and lingual planimetric fields statistically different in the range low-abrasive oral hygiene tablets Denttabs > non-abrasive experimental Gel > high-abrasive dentifrice Crest.

The abrasive dentifrice did not show superior cleaning ability in any of the planimetric fields.

Conclusions:

The non-abrasive oral hygiene gel formulation demonstrates optimal plaque removal ability and can be recommended for nursing conditions (home nursing as well as institutionalized nursing). Abrasivity of dentifrice does not contribute to plaque control.

Test Material



Fig. 1: Tested toothbrush ADA reference brush



Fig. 2: Experimental non-abrasive gel (A), low-abrasive oral hygiene tablets DENTTABS® (B) and high-abrasive dentifrice CREST® Pro-Health Whitening (C)

Indexing

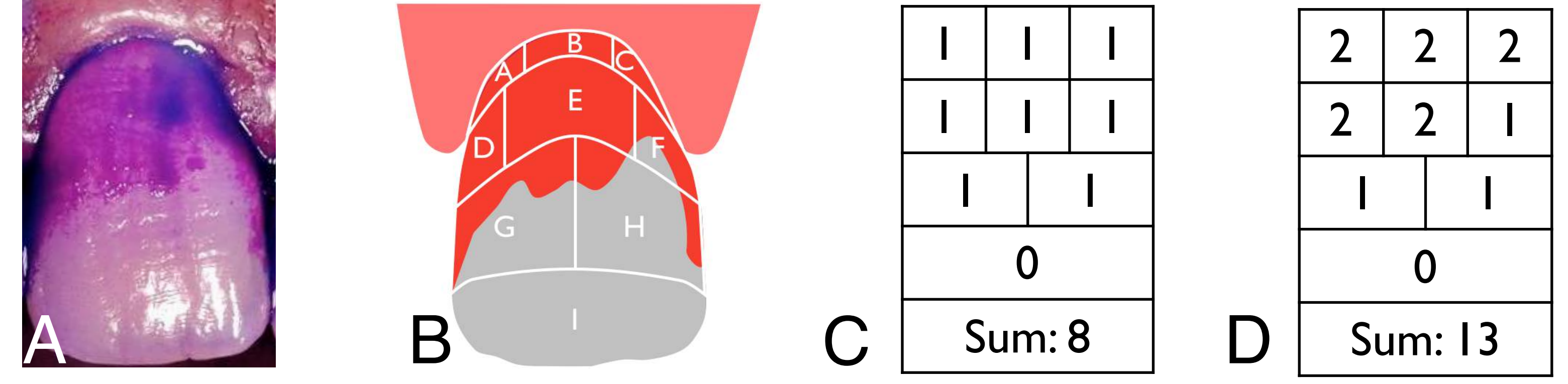


Fig. 3: (A) 3-day-plaque regrowth at incisor 11, (B) corresponding planimetric fields, (C) Claydon/ Addy Navy Plaque Index, assessment at 11, (D) modified PI from C (Lang et al. 2011) with more sensible score



Fig. 4: (A) Plaque assessment after 3-day-plaque regrowth before brushing via photographs to assignment of planimetric fields, (B) post brushing photograph, (C) assignment of planimetric fields, followed by coding field per field, tooth per tooth



Fig. 5: Special place for supervised, video-supported toothbrushing

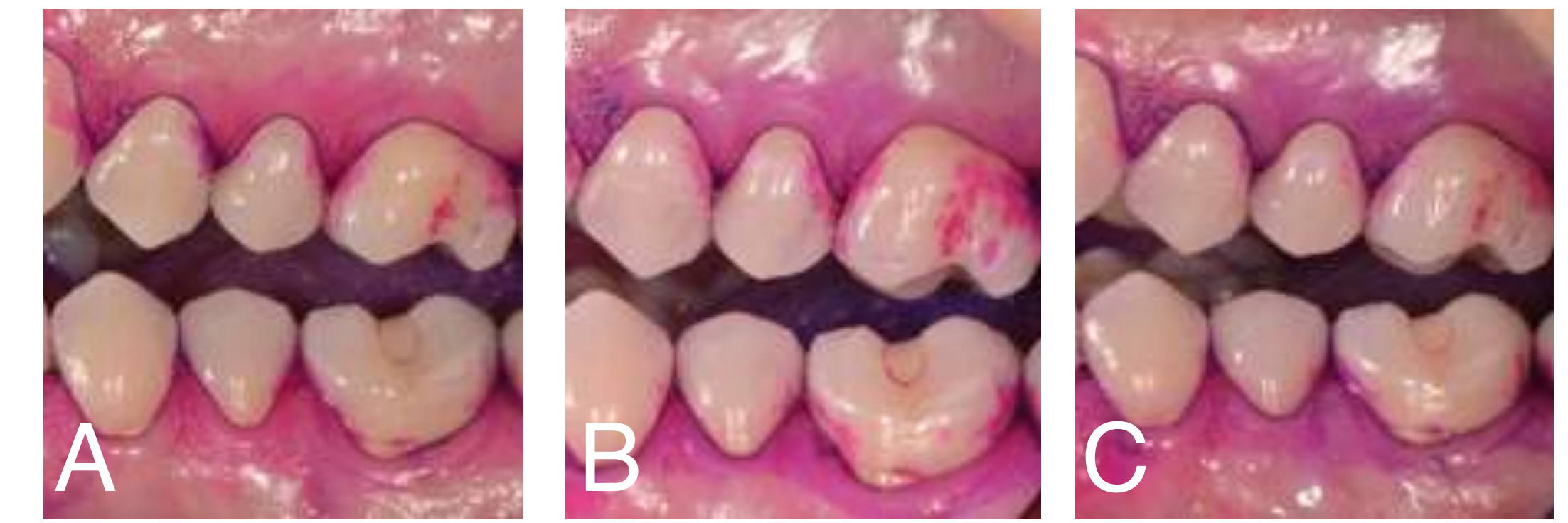


Fig. 6: Left buccal sextants after brushing with (A) CREST®, (B) DENTTABS® and (C) experimental gel

Results

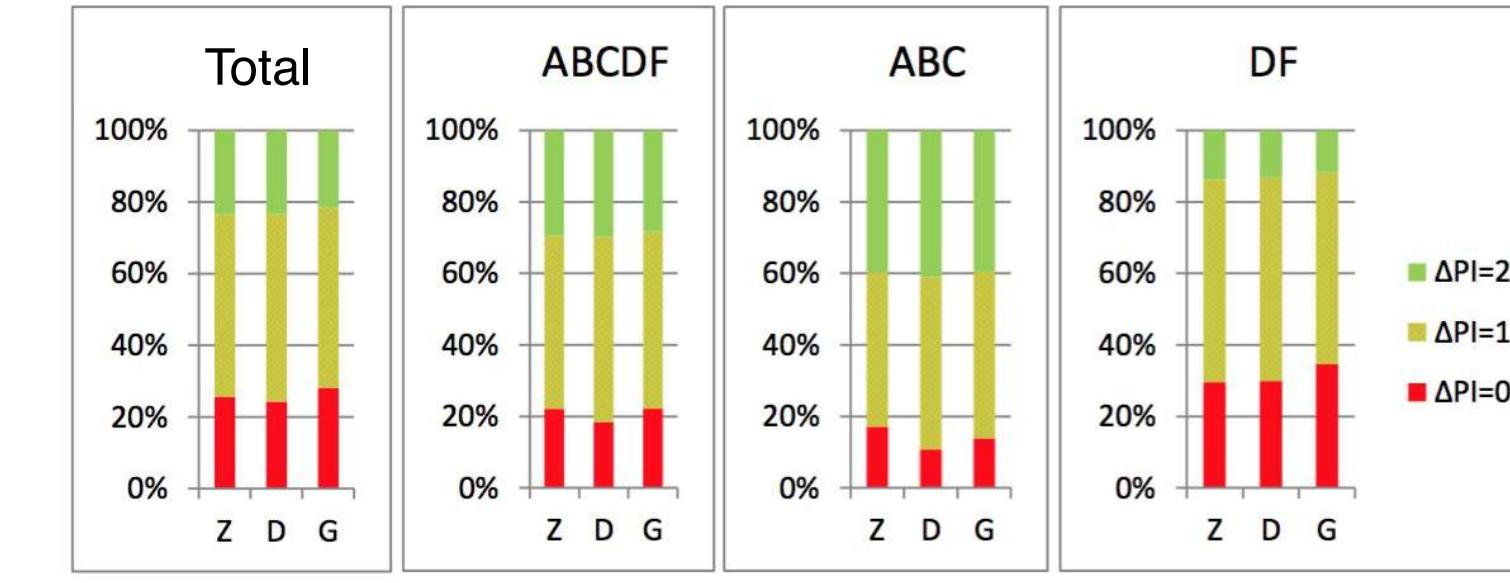


Fig. 7: Difference of pre-post-assessment (Delta PI) per single planimetric fields at buccal sites of upper jaw (Total - all sites, ABCDF - risk fields next to gum line and approximately, ABC - gumline alone, DF - approximal risk fields; Z - Crest, D - Denttabs, G - Gel)

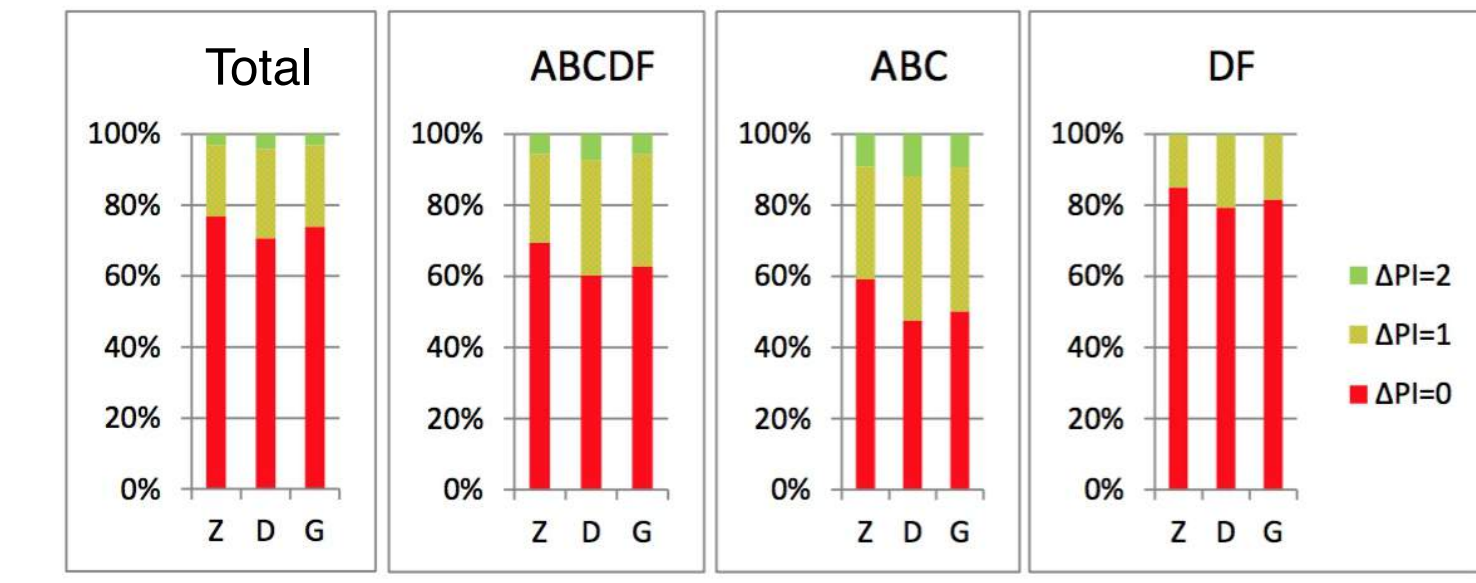


Fig. 8: Lingual sites upper jaw (Explanation see Fig. 7)

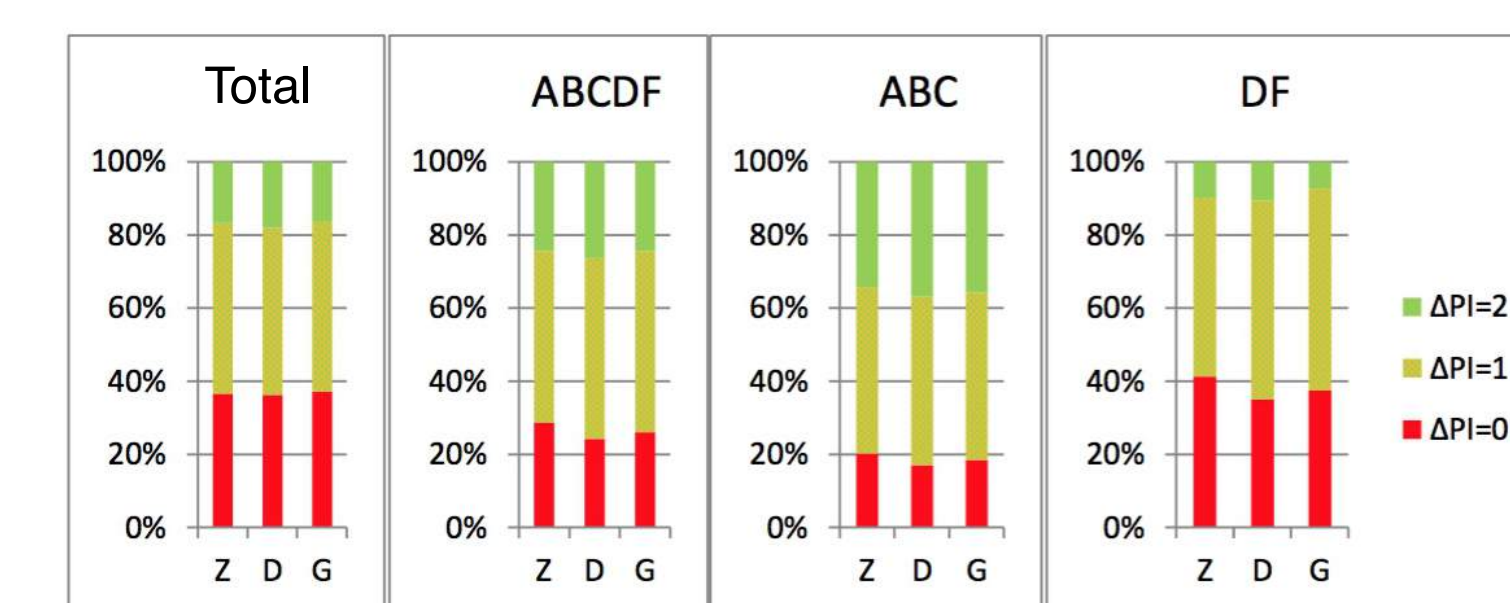


Fig. 9: Buccal sites lower jaw (Explanation see Fig. 7)

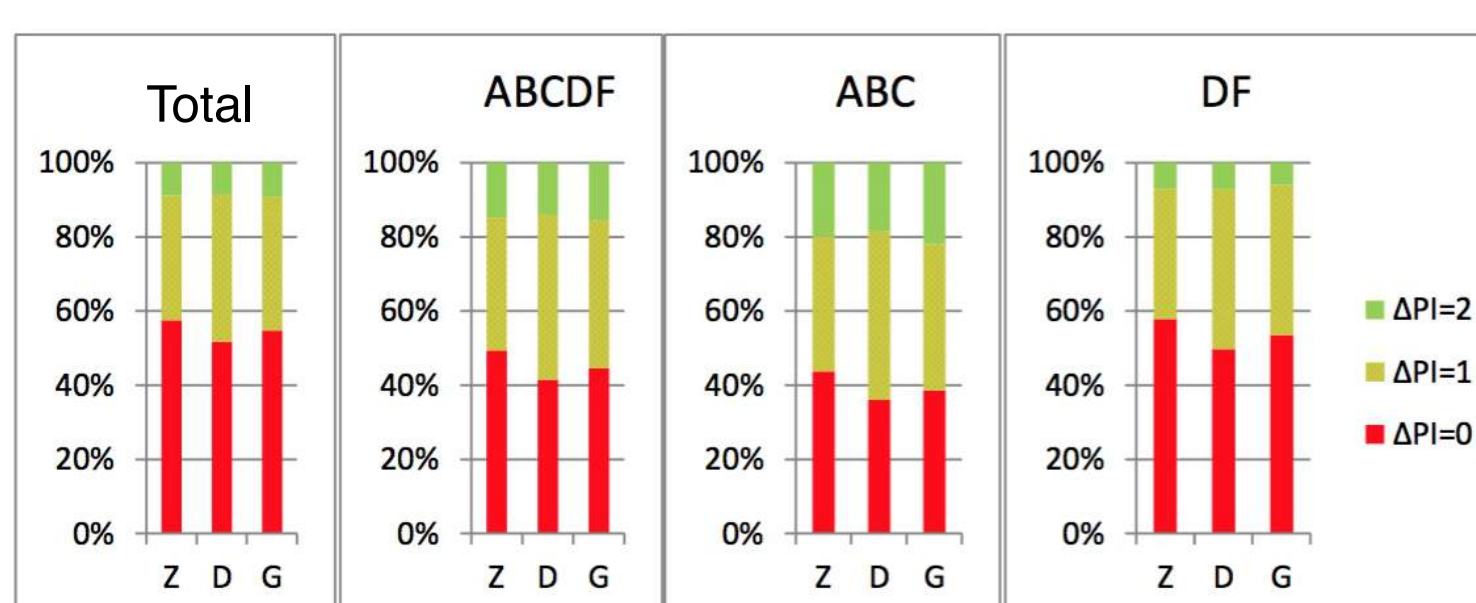


Fig. 10: Lingual sites lower jaw (Explanation see Fig. 7)

Statistical Differentiation

Mean (t-test) and median (WILCOXON-test) - Delta PI

Tab. 1: Upper jaw buccally

Statistical test: Plaque-Reduktion (total)				
Δ PI	CREST	DENTTABS	Gel	
Mean	0.98	0.99	0.94	
	Z vs. D	G vs. Z	G vs. D	
t-value	-0.65	-1.97	-2.59	
prob(t)	0.521	0.049	<0.01	
sign (p=0.05)	no	yes	yes	
Median	1	1	1	
	Z vs. D	G vs. Z	G vs. D	
W-value	0.60	1.81	2.39	
prob(W)	0.551	0.070	0.017	
sign (p=0.05)	no	no	yes	

Tab. 2: Lower jaw lingually

Statistical test: Plaque-Reduktion (total)				
Δ PI	CREST	DENTTABS	Gel	
Mean	0.26	0.34	0.29	
	Z vs. D	G vs. Z	G vs. D	
t-value	-4.50	1.84	-2.57	
prob(t)	<0.01	0.066	0.010	
sign (p=0.05)	yes	no	yes	
Median	0	0	0	
	Z vs. D	G vs. Z	G vs. D	
W-value	3.57	1.55	1.93	
prob(W)	<0.01	0.121	0.013	
sign (p=0.05)	yes	no	yes	

Tab. 3: Upper jaw buccally, risk fields

Statistical test: Plaque-Reduktion (ABCFD)				
Δ PI	CREST	DENTTABS	Gel	
Mean	1.07	1.11	1.06	
	Z vs. D	G vs. Z	G vs. D	
t-value	-1.47	-0.40	-1.82	
prob(t)	0.142	0.691	0.068	
sign (p=0.05)	no	no	no	
Median	1	1	1	
	Z vs. D	G vs. Z	G vs. D	
W-value	1.27	0.38	1.62	
prob(W)	0.203	0.705	0.106	
sign (p=0.05)	no	no	no	

Tab. 4: Lower jaw lingually, risk fields

Statistical test: Plaque-Reduktion (ABCFD)				
Δ PI	CREST	DENTTABS	Gel	
Mean	0.36	0.47	0.43	
	Z vs. D	G vs. Z	G vs. D	
t-value	-4.48	2.79	-1.61	
prob(t)	<0.01	<0.01	0.108	
sign (p=0.05)	yes	yes	no	
Median	0	0	0	
	Z vs. D	G vs. Z	G vs. D	
W-value	3.99	2.66	1.24	
prob(W)	<0.01	<0.01	0.216	
sign (p=0.05)	yes	yes	no	