Effect of Ultrasonic Toothbrushing in Periodontal Maintenance Treatment A. MAY, T. LANG, B. JENNES and P. GAENGLER – ORMED Institute for Oral Medicine at the University of Witten/Herdecke, Witten, Germany

OBJECTIVES

- It has been demonstrated that exclusively ultrasound-activated toothbrushing is an effective oral hygiene approach to control dental plaque, completely avoiding the risk of abrasive lesions on teeth and gums (S. Denda, JDR 91, Spec Iss B, 2209).
- Inflammation of the tooth attachment with bone loss and often gum bleeding are widespread and increasing among the population, finally resulting in tooth loss.
- Bacterial etiology of dysbiotic biofilms and usually powerful host responses, modulated by genetic and immunologic factors, play a major role.
- Periodontitis is, like dental caries, a life-long disease. Therefore, a lifelong dental follow-up including oral hygiene home care is needed.
- Consequently, a very soft but nevertheless highly effective toothbrushing technique with polishing or non-abrasive effects is important to avoid tooth wear.





METHODS

- After scaling and root planing of periodontitis teeth with shallow pockets 16 subjects aged 45 – 54 years were included in the ultrasonic test group, using ultrasonic toothbrush Emmi®-dental Professional and 17 subjects in the control group, using manual toothbrush Denttabs® and Denttabs® tooth cleaning tablets, undergoing a 4-day training period.
- Baseline and follow-up data of all teeth after 2, 4, 8 and 12 weeks comprised six-point pocket depth, planimetrical plaque index (Lang et al. 2011) at 9 fields per vestibular and oral sites of teeth and Gingiva Index. For statistical approval teeth 16, 26, 11, 36, 46, 31 were selected.
- The ultrasonic toothbrushing, used 2 times per day for 3 min., was exclusively ultrasound activated. Data underwent statistical analysis (t-test, U-test, Wilcoxon-test, χ^2 -test).
- The control-group was evaluated with the same parameters at the beginning and 12 weeks later.

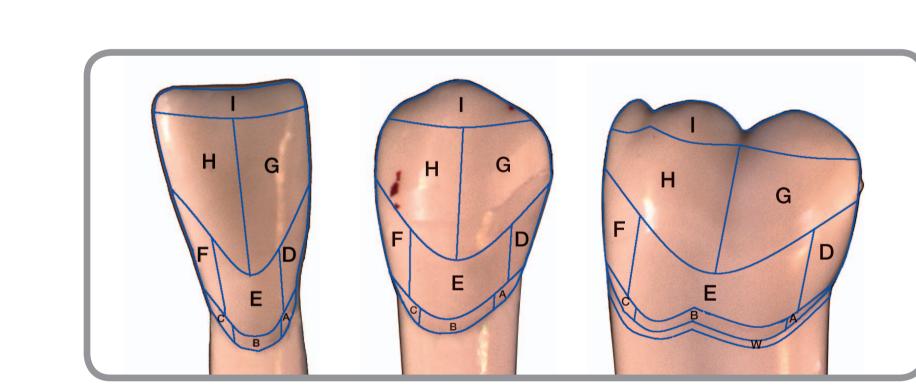
Postbrush

Photo documentation of plaque planimetry

Ultrasonic toothbrushing

Prebrush

Modified Navy-Plaque-Index (Claydon and Addy 1995) according to Lang et al. (2011) with planimetric fields A to I on the buccal and lingual surfaces (nine planimetric fields, code of plaque coating 0-2)



Manual toothbrushing



Study protocol

Week 2

Week 4

Week 8

Day 1: Start of study

Pocket depth baseline

Gingiva Index baseline

photo documentation

Navy-Plaque-Index

Pocket depth control

Gingiva Index control

photo documentation

Navy-Plaque-Index

Pocket depth control

Gingiva Index control

photo documentation

Navy-Plaque-Index

Pocket depth control

Gingiva Index control

photo documentation

Pocket depth control final

Gingiva Index control final

photo documentation final

Navy-Plaque-Index

Navy-Plaque-Index

Frequency distribution of pocket depth in the ultrasonic-group

End P=0		P = 0	P=1			
		PD < 3	3 ≤ PD < 4	4 ≤ PD < 5	5 ≤ PD	
Baseline						
P=0 P	D < 3	1097	242	17	1	1357
3 ≤ P	D < 4	417	376	24	11	828
P=1 4 ≤ P	D < 5	35	79	31	12	157
5 ≤ P	D	4	18	12	12	46
Sum		1553	715	84	36	2388

→ 417 out of 828 shallow pockets were eliminated

	End	P=0	P=1			Sum
		PD < 3	3 ≤ PD < 4	4 ≤ PD < 5	5 ≤ PD	
Base	line					
P=0	PD < 3	1210	289	2	0	1501
	3 ≤ PD < 4	314	461	20	0	795
P=1	4 ≤ PD < 5	12	49	12	2	75
	5 ≤ PD	0	5	1	5	11
	Sum	1536	804	35	7	2382
PD = pocket depth in mm						1

→ 314 out of 795 shallow pockets were eliminated

Statistical significance of eliminating shallow pockets

	End	Average Δ PD (Ultrasonic)	Average Δ PD (Manual)	prob (Test)	sign. (p=0,05)
Baseline					
P=0	PD < 3	+0.25 (n=1357)	+0.24 (n=1501)	0.87	No
	3 ≤ PD < 4	-0.59 (n=828)	-0.45 (n=795)	0.00	Yes
P=1	4 ≤ PD < 5	-0.77 (n=157)	-0.75 (n=75)	0.85	No
	5 ≤ PD	-1.21 (n=46)	-0.91 (n=11)	0.37	No
	Sum	-0.14 (n=2388)	-0.03 (n=2382)	0.00	Yes

➡ In the ultrasonic group disappeared more shallow pockets compared

End	GI = 0	GI = 1	GI = 2	GI=3	Sum
Baseline					
GI = 0	2010	99	57	0	2166
GI = 1	106	8	11	0	125
GI = 2	60	6	1	0	67
GI = 3	4	0	1	0	5
Sum	2180 (92.26%)	113 (4.78%)	70 (2.96%)	0 (0%)	2363 (100%)

The mean value of the GI decreased in the ultrasonic group from 0.12

to 0.11 (7.7%) and in the manual group from 0.17 to 0.13 (22.3%).

RESULTS

Frequency distribution of pocket depth in the manual-group

	End	P=0	P = 1			Sum
		PD < 3	3 ≤ PD < 4	4 ≤ PD < 5	5 ≤ PD	
Base	line					
P = 0	PD < 3	1210	289	2	0	1501
	3 ≤ PD < 4	314	461	20	0	795
P = 1	4 ≤ PD < 5	12	49	12	2	75
	5 ≤ PD	0	5	1	5	11
	Sum	1536	804	35	7	2382
		ı	ı	·		1

	Ena	(Ultrasonic)	(Manual)	prob (Test)	sign. (p=0,05)
Baseline					
P=0	PD < 3	+0.25 (n=1357)	+0.24 (n=1501)	0.87	No
P=1	3 ≤ PD < 4	-0.59 (n=828)	-0.45 (n=795)	0.00	Yes
	4 ≤ PD < 5	-0.77 (n=157)	-0.75 (n=75)	0.85	No
	5 ≤ PD	-1.21 (n=46)	-0.91 (n=11)	0.37	No
	Sum	-0.14 (n=2388)	-0.03 (n=2382)	0.00	Yes

to the manual group (t-test Satterthwaite-Welch).

Frequency distribution of the Gingival Index of the

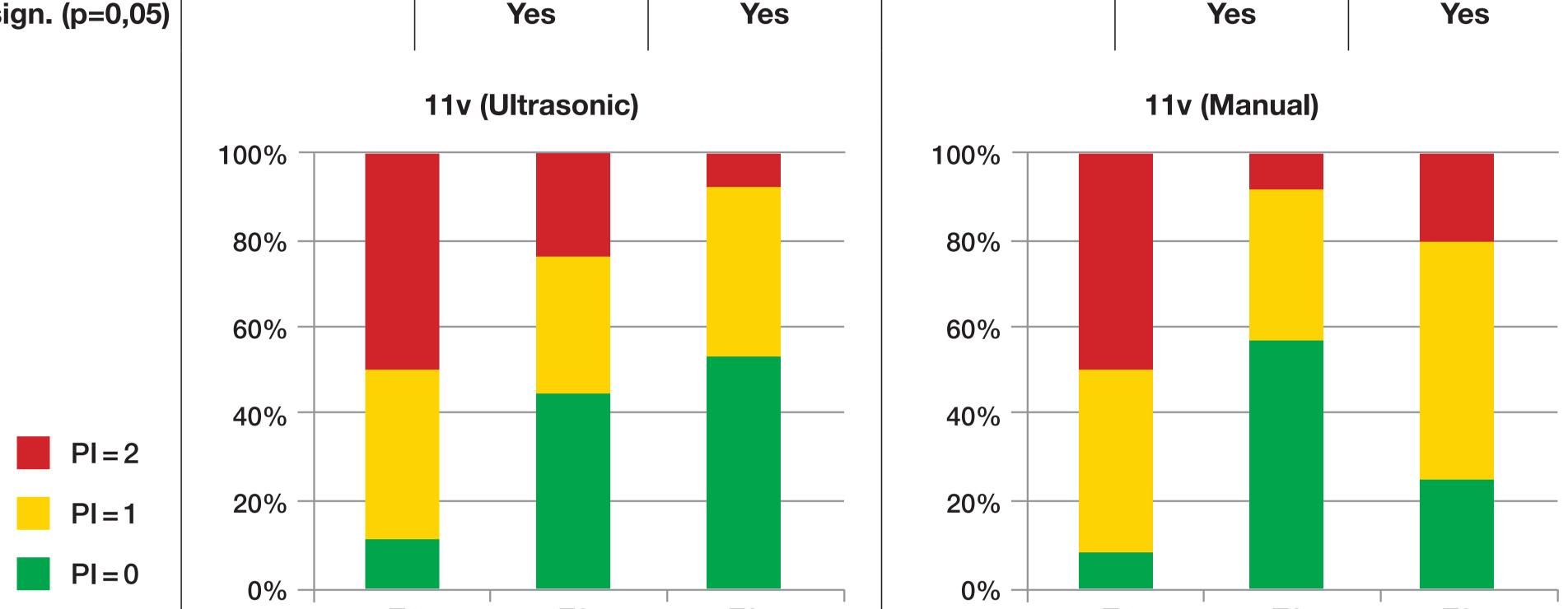
	End	GI = 0	GI = 1	GI = 2	GI=3	Sum
Baseline						
GI = 0		2010	99	57	0	2166
GI = 1		106	8	11	0	125
GI = 2		60	6	1	0	67
GI=3		4	0	1	0	5
Sum		2180 (92.26%)	113 (4.78%)	70 (2.96%)	0 (0%)	2363 (100%)
GI: Gingiva-Index according to Löe and Silness. Sample period: 92 days						

equency of the number of fields with a planimetric index code 0, 1, 2 in percent (%) at baseline (T1), supervision (T2)

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		Ultrasonic			Manual	
Time	T1	T2	Т3	T1	T2	Т3
n	144	144	144	144	144	144
% (PI = 2)	49,31	23,61	7,64	49,31	9,03	20,14
% (PI = 1)	39,58	30,56	39,58	42,36	35,42	52,78
% (PI=0)	11,11	45,83	52,78	8,33	55,56	27,08
χ²		$\chi^2 = 178,50$	$\chi^2=275,70$		$\chi^2 = 434,35$	$\chi^2 = 89,28$
sign. (p=0,05)		Yes	Yes		Yes	Yes

Percentage of plaque reduction (Example of one vestibular tooth site at incisor 11)



There was a significant plaque reduction from baseline up to the end of the study after 92 days.

- The plaque reduction at all planimetrical fields, buccally as well as lingually, was highest immediately after supervised brushing, later slightly increasing but statistically stable over the whole study period.
- This effective plaque control was documented in both groups, and there was no statistical difference between the test and the control group.

CONCLUSIONS

- → The ultrasonic toothbrushing contributes to gingival health and avoids completely the risk of abrasive wear at teeth and gums.
- → The outcome of scaling and root planing concerning the reduction of the number of shallow pockets is markedly improved by ultrasonic toothbrushing up to 3 months after treatment.

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