

Ultrasonic vs. Manual Toothbrushing in Orthodontic Patients with Manifest Gingivitis

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Objectives:

Plaque retention around orthodontic brackets increases the short term gingivitis risk and the long term caries risk in susceptible patients. It was, therefore, the aim of a randomized clinically-controlled study to compare the improvement (i) of plaque control and (ii) gingivitis control by ultrasonic vs. manual toothbrushing.

Material and Methods:

80 adolescents wearing fixed orthodontic appliances 6 month before removal and exhibiting ≥ 4 gingivitis teeth were randomly divided in 2 groups. The test group US (n=42) used the Emmi-dental ultrasonic toothbrush with emmi-dent ultrasound toothpaste (EMAG, Mörfelden-Waldorf, Germany). The control group CT (n=38) used the manual toothbrush with oral hygiene tablets (Denttabs, Berlin, Germany). The Gingiva-Index GI (Silness and Loe, 1964) with 4 codes was used at 6 points/tooth at baseline, after 3-day-plaque-regrowth at start of study, after 2 and 12 weeks. The number of gingivitis teeth according to the G (Gingivitis) P (Periodontitis) M (Missing) T (Teeth) Index is clinically more relevant concerning the severity and extend of gingivitis than the GI values. The Planimetric-Plaque-Index PPI, *in-vivo* version (Lang et al., 2011) was used at 8 index teeth with 6 planimetric fields buccally around the brackets and 6 planimetric fields orally. Blinded PPI coding by an independent researcher on intra-oral photographs was PPI=0 (no plaque), PPI=1 (less than 50 % of the planimetric field covered with plaque), PPI=2 (more than 50 % covered with plaque).

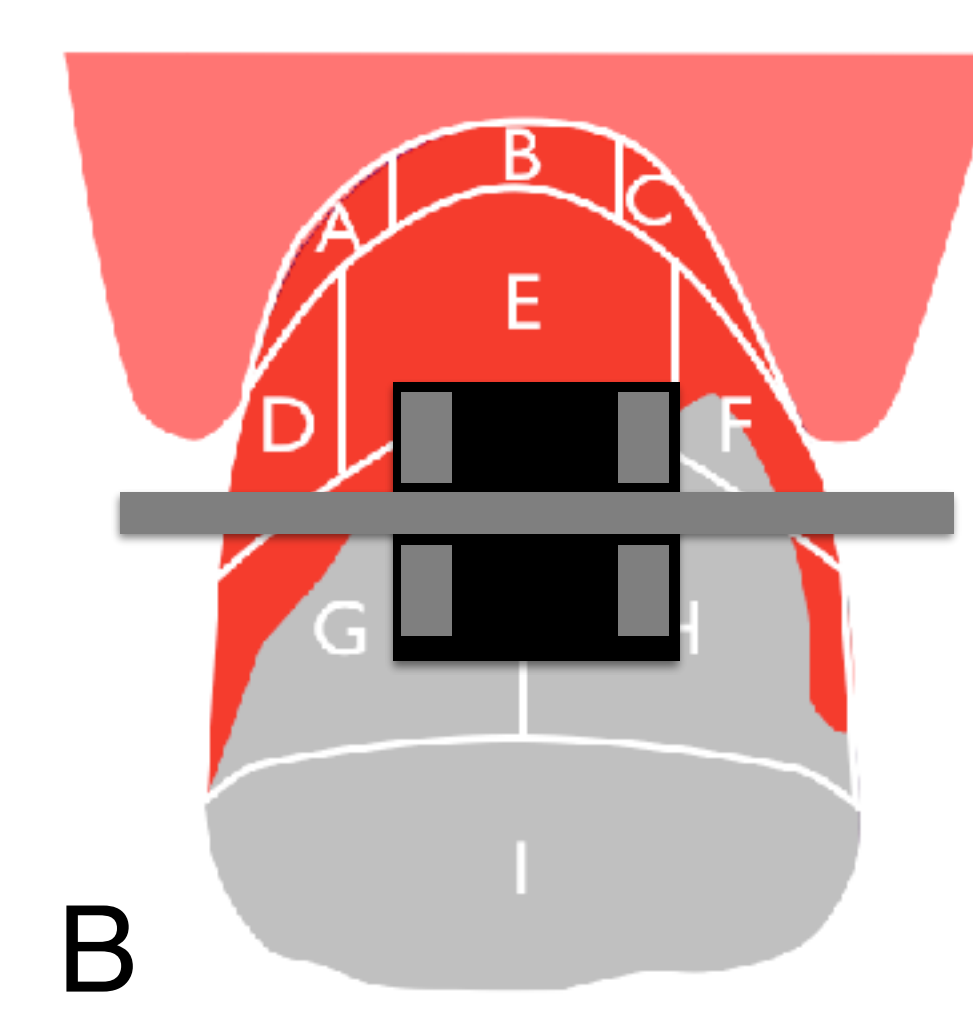
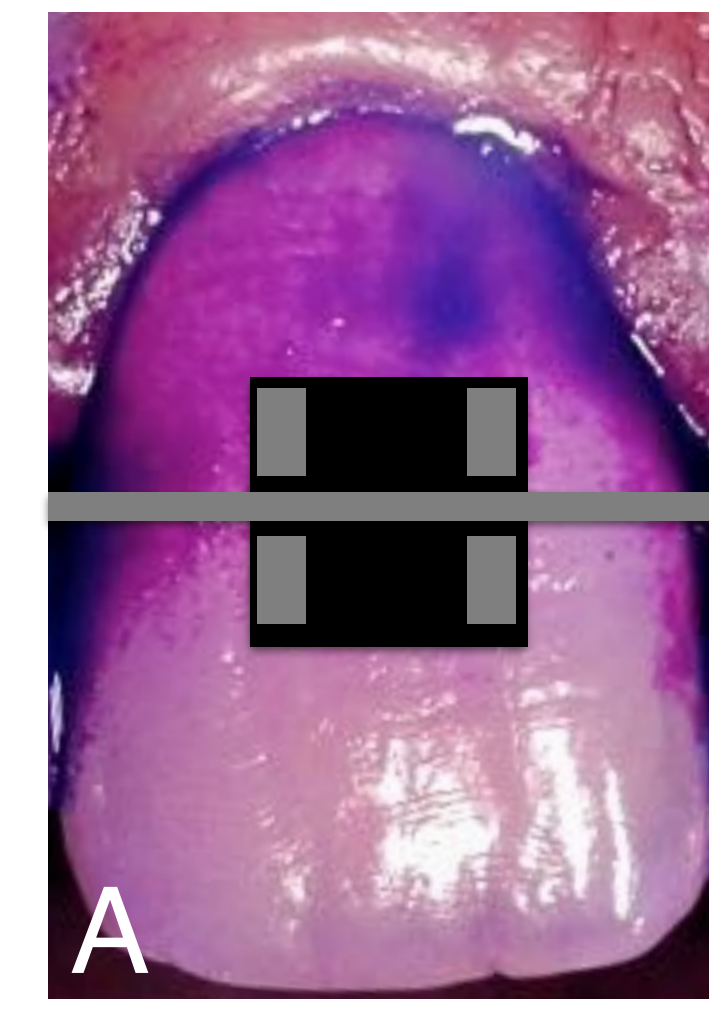
Results:

Highly significant reduction of gingivitis was documented for both groups, and the number of Gingivitis Teeth declined from mean 13 teeth to 4 teeth in the ultrasonic test group US and from 12 gingivitis teeth to 3 teeth in the Denttabs control group CT. There was a highly significant reduction of the plaque index PPI (Ultrasonic US from code 9.59 at baseline to code 0.45 at the end of the study, and manual toothbrush CT from code 9.64 at baseline to code 0.64 at the end of the study). There was no statistical difference in gingivitis reduction and plaque control between the two groups. Hard and soft tissue trauma has not been identified.

Conclusions:

The study confirms earlier results of plaque reduction and contribution to gingival health from ultrasonic toothbrushing (Denda, 2011 and May, 2013). The Emmi-dental Professional ultrasonic toothbrush used in a high risk cohort of subjects under orthodontic treatment and exhibiting chronic gingivitis is clinically effective in significant plaque reduction and highly significantly decreasing the number of gingivitis teeth. The improvement of oral hygiene is matching that of the control group. The advantage of ultrasonic brushing is the wear-free action.

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2	2	2
2	n/a	1
n/a	n/a	
0		
Sum: 9		

Fig. 1: Planimetric-Plaque-Index (Lang et al., 2011) A - Plaque accumulation around the orthodontic bracket, B - Planimetric fields of the PPI buccally, C - Coding of the PPI around the bracket.

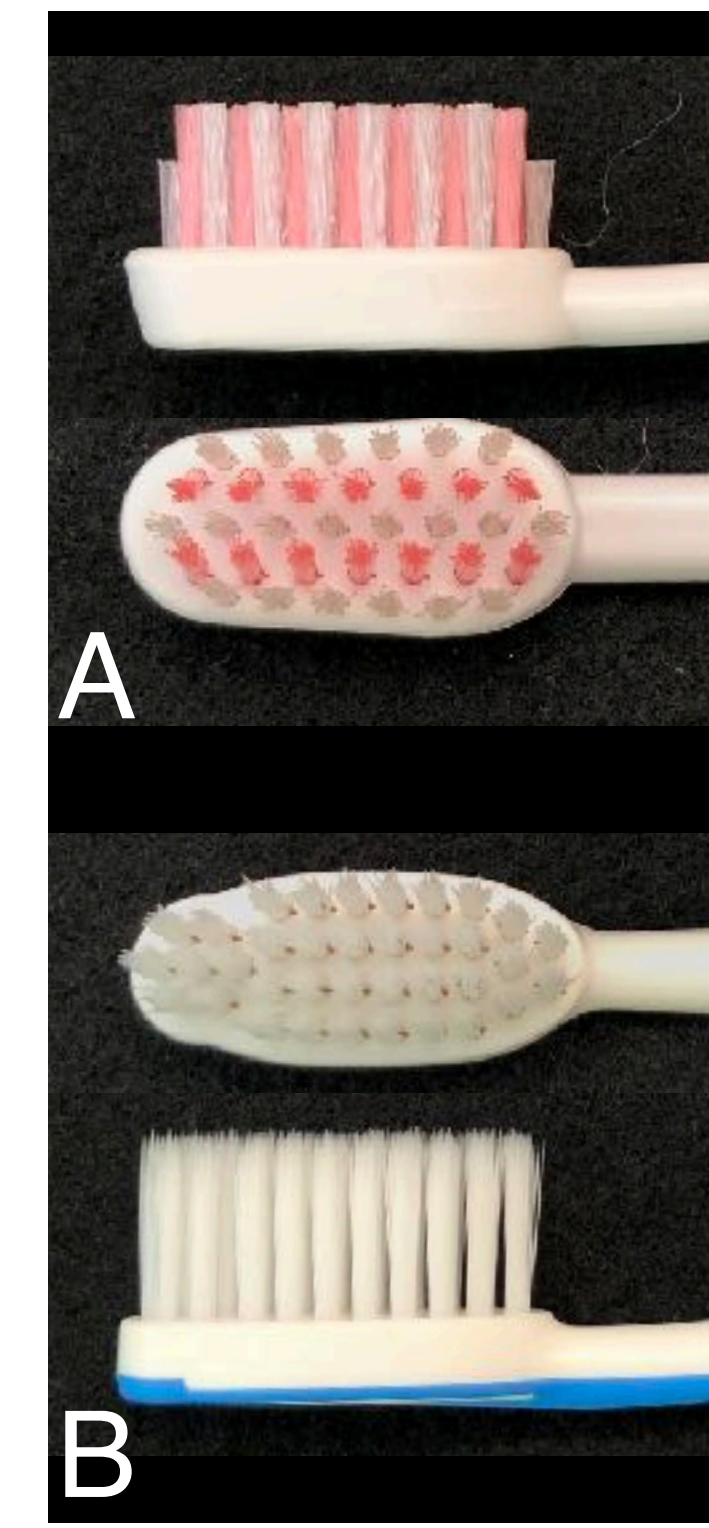


Fig. 2: A: Emmi-dental orthodontic brush head B: Denttabs brush head.



Fig. 3: Emmi-dental Professional ultrasound toothbrush with Emmi-Dent dentifrice.



Fig. 4: Manual Denttabs toothbrush with low abrasive oral hygiene tablets.



Fig. 5: Plaque revelation with Mira-2-Ton (red - young plaque, blue - old plaque) at the start of study after 3-day-plaque-regrowth before supervised ultrasonic toothbrushing (Subject number 3). Severe manifest gingivitis at teeth 11, 12, 31, 32, 33, 41 and 42.



Fig. 6: Plaque revelation at the start of study after supervised ultrasonic toothbrushing with the Emmi-dental Professional toothbrush and emmi-dent ultrasound toothpaste (Subject number 3).

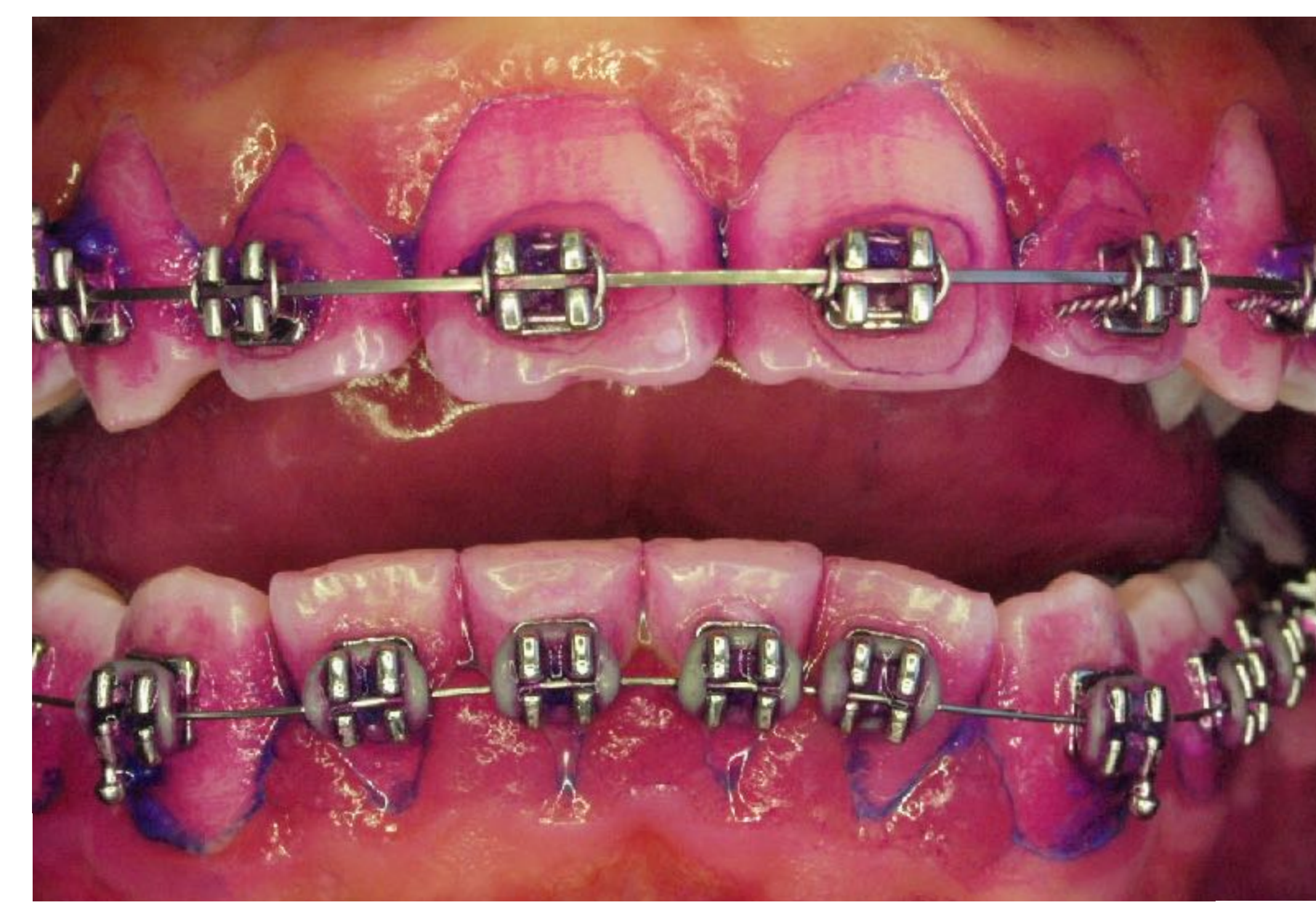


Fig. 7: Plaque revelation with Mira-2-Ton at the start of study after 3-day-plaque-regrowth before supervised manual toothbrushing with low abrasive Denttabs oral hygiene tablets and brush (Subject number 36). Severe manifest gingivitis at teeth 11, 12, 21, 22, 33, 32, 31, 41, 42 and 43.

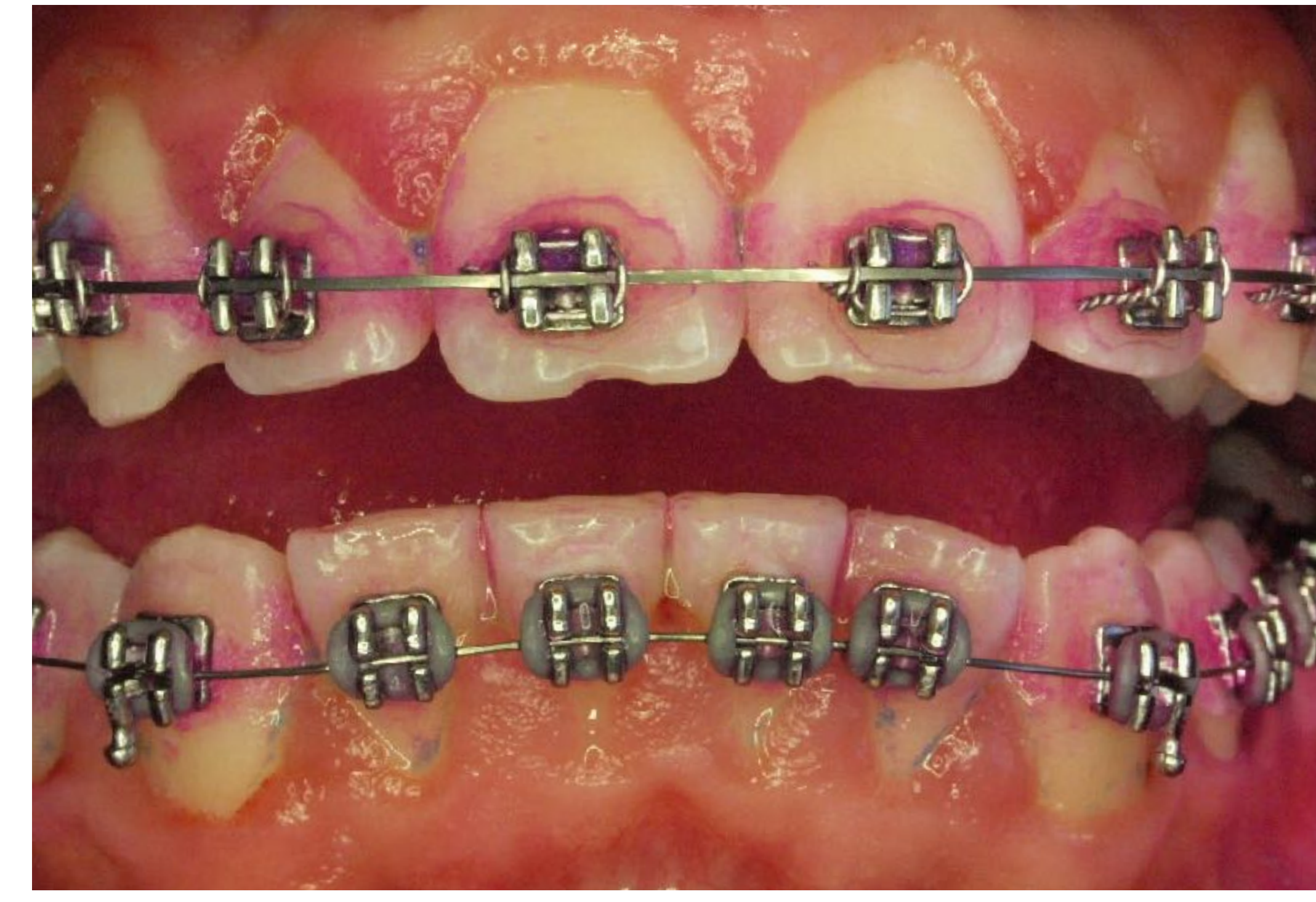


Fig. 8: Plaque revelation at the start of study after supervised manual toothbrushing with Denttabs oral hygiene tablets and toothbrush (Subject number 36).

Statistics	Baseline	Start of study	Two weeks	End of study
Med	13,00	14,00*	6,25***	4,00***
IQR	3,00	2,00	6,00	7,00

Tab 1.: Reduction of the number of gingivitis teeth from baseline to two weeks and twelve weeks, increase of the number of gingivitis teeth after 3-day-plaque-regrowth at the start of study; US group with ultrasonic toothbrushing.

PPI Values (Lang et al., 2011)	Buccally		Orally	
	M	SD	M	SD
PPI Differences				
PPI Baseline	9,64	1,37	8,25	1,59
PPI Start - End of study	0,64***	1,64	-0,57***	1,21

Tab 2: Reduction of PPI scores in the US group with ultrasonic toothbrushing from baseline to twelve weeks at buccal surfaces with brackets and non-bracketed oral surfaces.

Statistics	Baseline	Start of study	Two weeks	End of study
Med	12,00	13,50**	4,50***	3,00***
IQR	5,00	2,00	6,50	6,00

Tab 3: Reduction of the number of gingivitis teeth from baseline to two weeks and twelve weeks, increase after 3-day-plaque-regrowth at start of study; manual toothbrushing control group.

PPI Values (Lang et al., 2011)	Buccally		Orally	
	M	SD	M	SD
PPI Differences				
PPI Baseline	9,59	1,27	8,69	1,13
PPI Start - End of study	0,45**	1,12	-0,23***	1,37

Tab 4: Reduction of PPI scores in the manual toothbrushing control group from baseline to twelve weeks at buccal surfaces with brackets and non-bracketed oral surfaces.

* significant (p ≤ 0.05), ** very significant (p ≤ 0.01), *** highly significant (p ≤ 0.001)