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Effect of an Experimental Manual Toothbrush on Plaque and Gingivits Reduction

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Introduction

Many different brush designs are available on the market. However, there is a lack of data on their efficacy in plaque removal and gingivitis reduction on a long term basis.

Objectives

The aim of this study was to compare the efficacy in plaque removal and gingivitis reduction of the meridol® toothbrush (GABA International AG) with a standard toothbrush (ADA reference toothbrush) in a controlled, examiner blinded, 48h plaque regrowth splitmouth (I) and a 3 months controlled examiner blind parallel study.

Material und Methods

Participants

- 86 healthy male subjects between 18 and 63 years of age (27.3 ± 6.8y).
- At least 24 teeth (excluding wisdom teeth, teeth with crowns or extensive restorations, fixed orthodontic appliances, calculus).
- No characteristics, which might influence the toothbrushing procedure.
- No caries or periodontitis.
- No antibiotics or anti-inflammatory drugs during the last 2 months and the course of the study.

Course of the Study

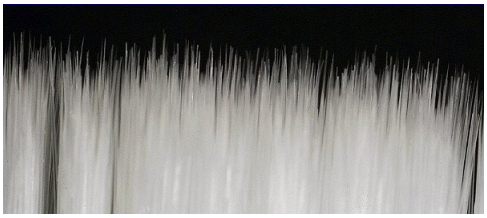
After a 12 day acclimatisation period and 48h of no oral hygiene measures the teeth of the upper right and lower left quadrant were brushed for one minute with either the meridol® or the reference toothbrush according to a pre-determined randomisation list stratified with respect to the handyness of the subject, followed by cleaning the other two quadrants with the complementary toothbrush, respectively.

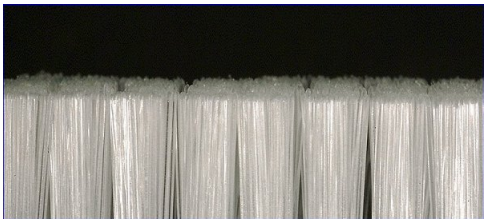
Immediately before and after tooth brushing (I) as well as after three months (II) plaque (Turesky modification of the Quigley-Hein Plaque Index), gingivitis (Löe & Sillness Gingival Index) and the number of gingival lesions = 5mm and > 5mm were evaluated by one examiner (E.B.) blinded with respect to the used toothbrushes.

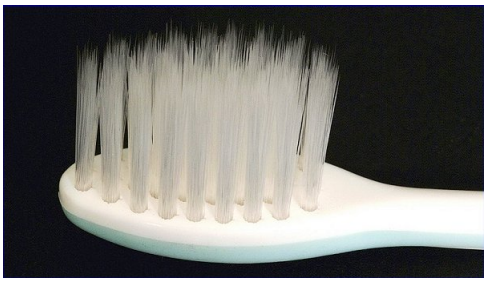
According to a randomisation schedule, which was stratified for smoking, the individuals were appointed either the test or the control group (n=43 each). All participants had to brush their teeth twice a day with the respective toothbrush and a standard tooth paste (Blend-a-med Standard, Procter & Gamble), only. Other oral hygiene procedures were not allowed. The toothbrushes were renewed every 6 weeks.

Data Management and Statistics

- Double data entry (SPSS Inc., U.S.A. Chicago).
- Gingivitis reduction were expressed as difference in GI between baseline and 3 months in absolute and relative values [%].
- The statistical unit was the single participant.
- Differences were tested for statistical significance with the non parametric Wilcoxon test for paired samples (I) and the non parametric Wilcoxon test for independent samples (II), respectively.
- The significance level was set at $p = 0.05$.
- The clinical relevance level was defined 5% relative reduction.
- Power analysis was performed with Sample Power® (SPSS Inc., U.S.A. Chicago).







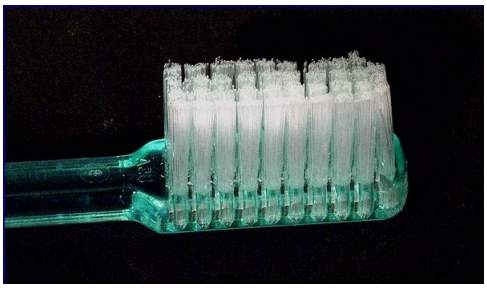


Fig. 1 meridol® toothbrush

Fig. 2 ADA reference toothbrush

Results

- 84 participants (meridol®: 27.7 ± 7.2y; ADA: 27.7 ± 6.5y) finished the study. Two participants (reference group) had to be rejected due to protocol violations.
- In total PI was reduced from 1.95 ± 0.48 to 1.02 ± 0.41 ($p < 0.001$) by the meridol® toothbrush and from 1.93 ± 0.52 to 1.09 ± 0.44 by the reference toothbrush ($p < 0.001$). This relates to a relative PI reduction of 47.4 ± 18.0% by the meridol® and of 44.1 ± 15.6% ($p=0.039$) by the reference toothbrush.
- At lingual sites the meridol® toothbrush reduced plaque by 30.6 ± 28.1% and the reference toothbrush by 24.0 ± 27.1% ($p=0.016$). For details see table 1.

site	brush	prebrushing	postbrushing	p	absolute red.	relative red.
	meridol®	2.03 ± 0.50	1.12 ± 0.43	<0.001	0.91 ± 0.43	44.1 ± 20.5
mesial	ADA	2.04 ± 0.55	1.21 ± 0.48	<0.001	0.83 ± 0.41	40.9 ± 17.4
	p	n.s.	0.013		0.047	0.031
	meridol®	1.83 ± 0.49	0.85 ± 0.52	<0.001	0.99 ± 0.46	53.6 ± 19.6
central	ADA	1.79 ± 0.56	0.89 ± 0.49	<0.001	0.90 ± 0.40	51.3 ± 18.3
	p	n.s.	n.s.		n.s.	n.s.
	meridol®	2.00 ± 0.50	1.11 ± 0.44	<0.001	0.89 ± 0.44	44.1 ± 19.6
distal	ADA	1.99 ± 0.52	1.19 ± 0.47	<0.001	0.79 ± 0.41	40.0 ± 17.3
	p	n.s.	n.s.		0.025	0.039
	meridol®	2.02 ± 0.49	1.11 ± 0.43	<0.001	0.90 ± 0.42	44.2 ± 18.8
proximal	ADA	2.01 ± 0.52	1.20 ± 0.45	<0.001	0.81 ± 0.38	40.5 ± 15.9
	p	n.s.	0.034		0.015	0.015

Tab. 1 Plaque scores at different sites. Pre- and postbrushing values are listed with the absolute and relative reductions.

- In total GI was reduced from 1.03 ± 0.16 to 0,76 ± 0,24 ($p < 0.001$) by the meridol® toothbrush and from 1.02 ± 0.15 to 0.79 ± 0.26 ($p < 0.001$) by the reference toothbrush. This relates to a relative reduction of 26.8 ± 18.4% by the meridol® and of 23.1 ± 18.4% (n.s.) by the reference toothbrush.
- At interdental surfaces GI was reduced from 1.05 ± 0.32 auf 0.88 ± 0.24 ($p < 0.001$) and from 0.97 ± 0.33 auf 0.91 ± 0.26 ($p < 0.001$) by the reference toothbrush. This relates to a relative reduction of 23.7 ± 18.2% by the meridol® and of 20.9 ± 17.3% by the reference toothbrush. For details see Table 2.

surfaces	brush	baseline	3 months	p	absolute red.	relative red.
	meridol®	1.12 ± 0.13	0.86 ± 0.28	< 0.001	0.26 ± 0.23	24.3 ± 22.2
mesio-buccal	ADA	1.12 ± 0.14	0.87 ± 0.27	< 0.001	0.25 ± 0.22	22.2 ± 20.3
	p	n.s.	n.s.		n.s.	n.s.
	meridol®	0.78 ± 0.25	0.55 ± 0.31	< 0.001	0.22 ± 0.21	31.3 ± 28.2
centro-buccal	ADA	0.78 ± 0.25	0.54 ± 0.29	< 0.001	0.24 ± 0.26	28.4 ± 33.2
	p	n.s.	n.s.		0.021	n.s.
	meridol®	1.22 ± 0.18	0.95 ± 0.27	< 0.001	0.27 ± 0.21	22.8 ± 18.1
disto-buccal	ADA	1.22 ± 0.16	0.98 ± 0.31	< 0.001	0.23 ± 0.25	19.6 ± 20.8
	p	n.s.	n.s.		n.s.	n.s.

	meridol®	1.12 ± 0.15	0.86 ± 0.26	0.001	0.26 ± 0.24	36.7 ± 29.5
mesio-lingual	ADA	1.14 ± 0.14	0.92 ± 0.27	< 0.001	0.22 ± 0.23	26.2 ± 34.0
	p	n.s.	0.007		n.s.	0.024
	meridol®	0.82 ± 0.25	0.55 ± 0.24	< 0.001	0.27 ± 0.24	33.7 ± 33.9
centro-lingual	ADA	0.76 ± 0.23	0.50 ± 0.31	< 0.001	0.26 ± 0.28	19.2 ± 96.2
	p	n.s.	n.s.		n.s.	n.s.
	meridol®	1.12 ± 0.17	0.85 ± 0.24	< 0.001	0.27 ± 0.21	24.1 ± 19.6
disto-lingual	ADA	1.12 ± 0.15	0.89 ± 0.27	< 0.001	0.24 ± 0.24	21.2 ± 21.1
	p	n.s.	n.s.		n.s.	n.s.

Tab. 2 Gingivitis scores at different sites. Baseline values and 3 months' values are listed with the absolute and relative reduction.

- After 3 months in the meridol® group 0.07 ± 0.46 and in the reference group 0.97 ± 1.81 gingival lesions = 5mm were found (p=0.002, Fig. 3). Lesions > 5mm did appear in neither group (Table 3).

Fig. 3 Gingival lesion at the palatal gingiva of a first upper molar (reference toothbrush).

lesion size	brush	baseline	3 months
	meridol®	0.0 ± 0.0	0.1 ± 0.5
≤ 5 mm	ADA	0.0 ± 0.0	1.0 ± 0.2
	p	n.s.	0.002
	meridol®	0.0 ± 0.0	0.0 ± 0.0
> 5 mm	ADA	0.0 ± 0.0	0.0 ± 0.0
	p	n.s.	n.s.

Tab. 3 Mean gingival lesions per subject at baseline and after 3 months.

Conclusions

Both brushes are significantly able to reduce plaque and gingivitis.
The meridol® toothbrush, however, showed a statistically significant better plaque removing efficacy and less gingival traumatisation compared to the ADA reference toothbrush. This study was supported by GABA International AG.

This poster was submitted by Priv.-Doz. Dr. med. dent. Christof Dörfer.

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Poster Faksimile:

647 Effect of an Experimental Manual Toothbrush on Plaque and Gingivits Reduction

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Aim

To compare the efficacy in plaque removal and gingivits reduction of the meridol® toothbrush (GABA International AG) with a standard toothbrush (ADA reference toothbrush) in a controlled, examiner blinded, 48h plaque regrowth splitmouth (I) and a 3 months controlled examiner blind parallel study.

Material and Methods

Participants

- 86 healthy male subjects between 18 and 63 years of age (27.3±6.8y).
- At least 24 teeth (excluding wisdom teeth, teeth with crowns or extensive restorations, fixed orthodontic appliances, calculus).
- No characteristics, which might influence the toothbrushing procedure.
- No caries or periodontitis.
- No antibiotics or anti-inflammatory drugs during the last 2 months and the course of the study.

Course of the Study

After a 12 day acclimatisation period and 48h of no oral hygiene measures the teeth of the upper right and lower left quadrant were brushed for one minute with either the meridol® or the reference toothbrush according to a pre-determined randomisation list stratified with respect to the handyness of the subject, followed by cleaning the other two quadrants with the complementary toothbrush, respectively.

Immediately before and after tooth brushing (I) as well as after three months (II) plaque (Turesky modification of the Quigley-Hein Plaque Index), gingivitis (Löe & Silness Gingival Index) and the number of gingival lesions < 5mm and >5mm were evaluated by one examiner (E.B.) blinded with respect to the used toothbrushes.

According to a randomisation schedule, which was stratified for smoking, the individuals were appointed either the test or the control group (n=43 each). All participants had to brush their teeth twice a day with the respective toothbrush and a standard tooth paste (Blend-a-med Standard, Procter & Gamble), only. Other oral hygiene procedures were not allowed. The toothbrushes were renewed every 6 weeks.

Data Management and Statistics

- Double data entry (SPSS Inc., U.S.A. Chicago).
- Gingivitis reduction were expressed as difference in GI between baseline and 3 months in absolute and relative values [%].
- The statistical unit was the single participant.
- Differences were tested for statistical significance with the non parametric Wilcoxon test for paired samples (I) and the non parametric Wilcoxon test for independent samples (II), respectively.
- The significance level was set at $p = 0.05$.
- The clinical relevance level was defined 5% relative reduction.
- Power analysis was performed with Sample Power® (SPSS Inc., U.S.A. Chicago).

Fig. 1 meridol® toothbrush

Fig. 2 ADA reference toothbrush

Tab. 1 Plaque scores at different sites. Pre- and postbrushing values are listed with the absolute and relative reductions.

site	brush	prebrushing	postbrushing	p	absolute red.	relative red.
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central	meridol®	1.83±0.49	0.85±0.42	<0.001	0.99±0.46	53.6±19.6
	ADA	1.79±0.56	0.89±0.49	<0.001	0.90±0.40	51.3±18.3
	p	n.s.	n.s.		n.s.	n.s.
distal	meridol®	2.00±0.50	1.11±0.44	<0.001	0.89±0.44	44.1±19.6
	ADA	1.99±0.52	1.19±0.47	<0.001	0.79±0.41	40.8±17.3
	p	n.s.	n.s.		0.025	0.026
proximal	meridol®	2.02±0.49	1.11±0.43	<0.001	0.90±0.42	44.2±18.8
	ADA	2.01±0.52	1.20±0.45	<0.001	0.81±0.38	40.5±15.9
	p	n.s.	0.034		0.015	0.015

Tab. 2 Gingivits scores at different sites. Baseline values and 3 months' values are listed with the absolute and relative reduction.

surfaces	brush	baseline	3 months	p	absolute red.	relative red.
meso-buccal	meridol®	1.12±0.13	0.66±0.28	<0.001	0.26±0.23	24.3±22.2
	ADA	1.12±0.14	0.87±0.27	<0.001	0.25±0.22	22.3±20.3
	p	n.s.	n.s.		n.s.	n.s.
centro-buccal	meridol®	0.78±0.25	0.55±0.31	<0.001	0.22±0.21	31.3±28.2
	ADA	0.76±0.25	0.54±0.29	<0.001	0.24±0.25	28.4±33.2
	p	n.s.	n.s.		0.021	n.s.
disto-buccal	meridol®	1.22±0.18	0.95±0.27	<0.001	0.27±0.21	22.8±18.1
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	p	n.s.	n.s.		n.s.	n.s.
meso-lingual	meridol®	1.10±0.15	0.86±0.26	0.001	0.26±0.24	36.7±26.5
	ADA	1.14±0.14	0.92±0.27	<0.001	0.22±0.23	26.2±34.0
	p	n.s.	0.007		n.s.	0.024
centro-lingual	meridol®	0.82±0.25	0.55±0.24	<0.001	0.27±0.24	33.7±33.9
	ADA	0.76±0.23	0.50±0.31	<0.001	0.26±0.28	33.2±36.2
	p	n.s.	n.s.		n.s.	n.s.
disto-lingual	meridol®	1.12±0.17	0.85±0.24	<0.001	0.27±0.21	24.1±19.6
	ADA	1.12±0.15	0.89±0.27	<0.001	0.24±0.24	21.2±21.1
	p	n.s.	n.s.		n.s.	n.s.

Tab. 3 Mean gingival lesions per subject at baseline and after 3 months.

lesion size	brush	baseline	3 months
≤ 5 mm	meridol®	0.0±0.0	0.1±0.5
	ADA	0.0±0.0	1.0±0.2
	p	n.s.	0.002
> 5 mm	meridol®	0.0±0.0	0.0±0.0
	ADA	0.0±0.0	0.0±0.0
	p	n.s.	n.s.

Fig. 3 Gingival lesion at the palatal gingiva of a first upper molar (reference toothbrush).

Results

- 84 participants (meridol®: 27.7±7.2y; ADA: 27.7±6.5y) finished the study. Two participants (reference group) had to be rejected due to protocol violations.
- In total **PI** was reduced from 1.95±0.48 to 1.02±0.41 ($p<0.001$) by the meridol® toothbrush and from 1.93±0.52 to 1.09±0.44 by the reference toothbrush ($p<0.001$). This relates to a relative **PI** reduction of 47.4±18.0% by the meridol® and of 44.1±15.6% ($p=0.039$) by the reference toothbrush.
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- After 3 months in the meridol® group 0.07±0.46 and in the reference group 0.97±1.81 **gingival lesions** ≤5mm were found ($p=0.002$, Fig. 3). Lesions >5mm did appear in neither group (Table 3).

Conclusions

Both brushes are significantly able to reduce plaque and gingivits.

The meridol® toothbrush, however, showed a statistically significant better plaque removing efficacy and less gingival traumatisation compared to the ADA reference toothbrush.

This study was supported by GABA International AG.

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