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Power toothbrushes

Gingival health / plaque removal

Meta-analysis

The Effectiveness of Manual versus High-Frequency, High-Amplitude, Sonic-Powered Toothbrushes for Oral Health: A Meta-Analysis

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Objective

To compare the everyday efficacy of high-frequency, high-amplitude, sonic-powered toothbrushes versus manual toothbrushes on plaque removal and gingivitis reduction through a meta-analysis of short-term clinical studies.

Methodology

Studies were eligible if they were randomized controlled clinical trials which evaluated both manual and sonic-powered toothbrushes on plaque or gingivitis reduction over a period of four weeks to three months in subjects without disability affecting toothbrushing. Single-use and clinician supervised studies were excluded. To identify eligible studies, searches were performed in databases of scientific publications (Embase, MEDLINE, BIOSIS, Inspec, PQ-SciTech, Compendex, SciSearch) as well as the electronic database of IADR abstracts. Data were extracted from qualifying studies, and investigators were contacted when insufficient information was available. To allow for the meta-analysis, data were pooled to compute standardized mean differences (SMD) and 95% confidence intervals (95% CI) using random-effects models to quantify differences in plaque removal or gingivitis reduction for each study as well as for the overall weighted average across included studies. Sources of heterogeneity and risk for bias were assessed.

Results

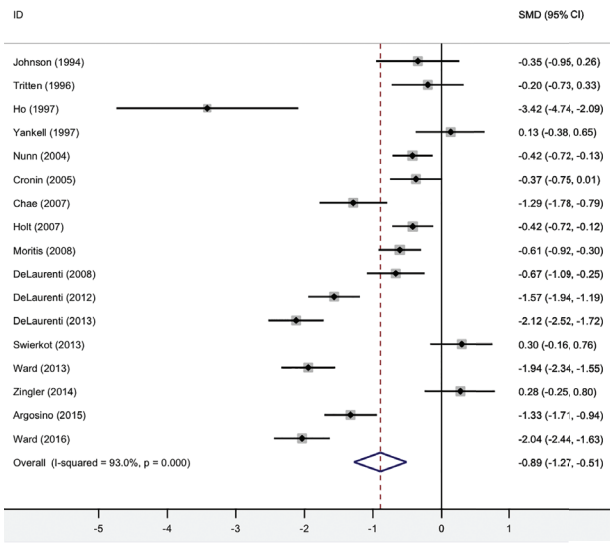
Overall, 18 studies comprising 1,870 subjects were included. The results demonstrated that high-frequency, high-amplitude sonic-powered toothbrushes resulted in statistically significantly greater reductions in plaque (SMD = -0.89, 95% CI = [-1.27, -0.51]) and gingivitis (-0.67, [-1.01, -0.32]) when compared to manual toothbrushes. In practical terms, this equates to approximately 20% more plaque removal and 10% greater decrease in gingivitis in everyday use. Although heterogeneity was large, sensitivity and subgroup analysis showed that outcomes were robust, and bias was not apparent.

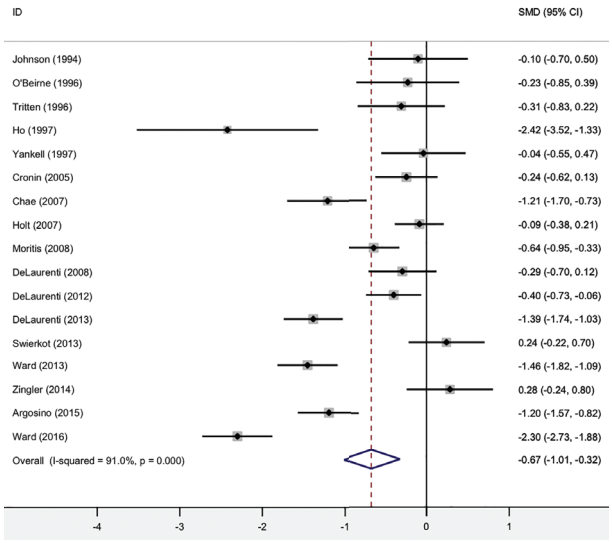
Conclusion:

High-frequency, high-amplitude, sonic-powered toothbrushes decreased plaque and gingivitis significantly more effectively than manual toothbrushes in everyday use in studies lasting from four weeks up to three months.

Standardized Mean Difference and Confidence Intervals for plaque removal and gingivitis reduction

Results and forest plots for each study with Standardized Mean Difference (SMD) and 95% Confidence Intervals (95% CI) comparing sonic powered versus manual toothbrushes for (left) plaque removal and (right) gingivitis reduction. SMD<0 favors the powered toothbrush.





Key Characteristics of Included Studies

Reference	Subjects	Powered Toothbrush	Manual Toothbrush	Final Timepoint
Johnson 1994	Adults with gingivitis, 20-54 yrs	Sonicare Advance	Oral-B 30	4 weeks
O'Beirne 1996	Adults with periodontitis, 18-65 yrs	Sonicare Advance	Oral-B	8 weeks
Tritten 1996	Adults with gingivitis, 18-65 yrs	Sonicare Advance	Butler 311	12 weeks
Ho 1997	Orthodontic adolescents, 11-18 yrs	Sonicare Advance	Oral-B P 35	4 weeks
Yankell 1997	Adults, 18-50 yrs	Sonicare Advance	Oral-B P 35	30 days
Nunn 2004	Adults, 18-68 yrs	Sonicare Crest IntelliClean	Oral-B P 35	4 weeks
Cronin 2005	Not specified	Oral-B Sonic Complete	Not provided	3 months
Chae 2007	Adults with mild-moderate periodontitis, 25-55 yrs	Sonicare Elite	Butler 311	12 weeks
Holt 2007	Adults with moderate gingivitis, 18-64 yrs	Sonicare FlexCare	Oral-B P40	4 weeks
Moritis 2008	Adults with moderate gingivitis, 19-62 yrs	Sonicare Elite	Oral-B P40	4 weeks
DeLaurenti 2008	Orthodontic subjects, 12-42 yrs	Sonicare FlexCare	Oral-B P40	4 weeks
DeLaurenti 2012	Adults with mild-moderate gingivitis, 20-70 yrs	Sonicare FlexCare+	ADA reference	4 weeks
DeLaurenti 2013	Adults with mild-moderate gingivitis, 18-64 yrs	Sonicare FlexCare Platinum	ADA reference	4 weeks
Swierkot 2013*	Partially edentulous with posterior implants, 45-78 yrs	Sonicare FlexCare	Oral-B P40	3 months
Ward 2013	Adults with mild-moderate gingivitis, 18-65 yrs	Sonicare FlexCare Platinum	ADA reference	4 weeks
Zingler 2014	Orthodontic adolescents, 11-15 yrs	Sonicare FlexCare	Elmex	12 weeks
Argosino 2015	Adults with mild-moderate gingivitis, 18-64 yrs	Sonicare 3 Series	ADA reference	4 weeks
Ward 2016	Adults with mild-moderate gingivitis, 19-64 yrs	Sonicare FlexCare Platinum	ADA reference	6 weeks

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* Study reported data for natural teeth and implant sites separately.