Powered versus manual toothbrushing for oral health (Review)

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[Intervention Review]

Powered versus manual toothbrushing for oral health

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ABSTRACT

Background

Removing dental plaque may play a key role maintaining oral health. There is conflicting evidence for the relative merits of manual and powered toothbrushing in achieving this. This is an update of a Cochrane review first published in 2003, and previously updated in 2005.

Objectives

To compare manual and powered toothbrushes in everyday use, by people of any age, in relation to the removal of plaque, the health of the gingivae, staining and calculus, dependability, adverse effects and cost.

Search methods

We searched the following electronic databases: the Cochrane Oral Health Group's Trials Register (to 23 January 2014), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2014, Issue 1), MEDLINE via OVID (1946 to 23 January 2014), EMBASE via OVID (1980 to 23 January 2014) and CINAHL via EBSCO (1980 to 23 January 2014). We searched the US National Institutes of Health Trials Register and the WHO Clinical Trials Registry Platform for ongoing trials. No restrictions were placed on the language or date of publication when searching the electronic databases.

Selection criteria

Randomised controlled trials of at least four weeks of unsupervised powered toothbrushing versus manual toothbrushing for oral health in children and adults.

Data collection and analysis

We used standard methodological procedures expected by The Cochrane Collaboration. Random-effects models were used provided there were four or more studies included in the meta-analysis, otherwise fixed-effect models were used. Data were classed as short term (one to three months) and long term (greater than three months).

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Main results

Fifty-six trials met the inclusion criteria; 51 trials involving 4624 participants provided data for meta-analysis. Five trials were at low risk of bias, five at high and 46 at unclear risk of bias.

There is moderate quality evidence that powered toothbrushes provide a statistically significant benefit compared with manual toothbrushes with regard to the reduction of plaque in both the short term (standardised mean difference (SMD) -0.50 (95% confidence interval (CI) -0.70 to -0.31); 40 trials, n = 2871) and long term (SMD -0.47 (95% CI -0.82 to -0.11; 14 trials, n = 978). These results correspond to an 11% reduction in plaque for the Quigley Hein index (Turesky) in the short term and 21% reduction long term. Both meta-analyses showed high levels of heterogeneity (I^2 = 83% and 86% respectively) that was not explained by the different powered toothbrush type subgroups.

With regard to gingivitis, there is moderate quality evidence that powered toothbrushes again provide a statistically significant benefit when compared with manual toothbrushes both in the short term (SMD -0.43 (95% CI -0.60 to -0.25); 44 trials, n = 3345) and long term (SMD -0.21 (95% CI -0.31 to -0.12); 16 trials, n = 1645). This corresponds to a 6% and 11% reduction in gingivitis for the Löe and Silness index respectively. Both meta-analyses showed high levels of heterogeneity (I^2 = 82% and 51% respectively) that was not explained by the different powered toothbrush type subgroups.

The number of trials for each type of powered toothbrush varied: side to side (10 trials), counter oscillation (five trials), rotation oscillation (27 trials), circular (two trials), ultrasonic (seven trials), ionic (four trials) and unknown (five trials). The greatest body of evidence was for rotation oscillation brushes which demonstrated a statistically significant reduction in plaque and gingivitis at both time points.

Authors' conclusions

Powered toothbrushes reduce plaque and gingivitis more than manual toothbrushing in the short and long term. The clinical importance of these findings remains unclear. Observation of methodological guidelines and greater standardisation of design would benefit both future trials and meta-analyses.

Cost, reliability and side effects were inconsistently reported. Any reported side effects were localised and only temporary.

PLAIN LANGUAGE SUMMARY

Powered/electric toothbrushes compared to manual toothbrushes for maintaining oral health

Review question

This review has been conducted to assess the effects of using a powered (or 'electric') toothbrush compared with using a manual toothbrush for maintaining oral health.

Background

Good oral hygiene, through the removal of plaque (a sticky film containing bacteria) by effective toothbrushing has an important role in the prevention of gum disease and tooth decay. Dental plaque is the primary cause of gingivitis (gum inflammation) and is implicated in the progression to periodontitis, a more serious form of gum disease that affects the tissues that support the teeth. The build up of plaque can also lead to tooth decay. Both gum disease and tooth decay are the primary reasons for tooth loss.

There are numerous different types of powered toothbrushes available to the public, ranging in price and mode of action. Different powered toothbrushes work in different ways (such as moving from side to side or in a circular motion). Powered toothbrushes also vary drastically in price. It is important to know whether powered toothbrushes are more effective at removing plaque than manual toothbrushes, and whether their use reduces the inflammation of the gums (gingivitis) and prevents or slows the progression of periodontitis.

Study characteristics

Authors from the Cochrane Oral Health Group carried out this review of existing studies and the evidence is current up to 23 January 2014. It includes 56 studies published from 1964 to 2011 in which 5068 participants were randomised to receive either a powered toothbrush or a manual toothbrush. Majority of the studies included adults, and over 50% of the studies used a type of powered toothbrush that had a rotation oscillation mode of action (where the brush head rotates in one direction and then the other).

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Key results

The evidence produced shows benefits in using a powered toothbrush when compared with a manual toothbrush. There was an 11% reduction in plaque at one to three months of use, and a 21% reduction in plaque when assessed after three months of use. For gingivitis, there was a 6% reduction at one to three months of use and an 11% reduction when assessed after three months of use. The benefits of this for long-term dental health are unclear.

Few studies reported on side effects; any reported side effects were localised and only temporary.

Quality of the evidence

The evidence relating to plaque and gingivitis was considered to be of moderate quality.

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