The efficacy of dental floss in addition to a toothbrush on plaque and parameters of gingival inflammation: a systematic review
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CRD summary
This review found that dental flossing provided no benefit above and beyond toothbrushing on the removal of plaque and the reduction of gingivitis. The authors stated that the dental professional should determine, on an individual patient basis, whether high quality flossing is an achievable goal. The authors’ conclusions are supported by the evidence provided.

Authors’ objectives
To assess the effect of dental floss in combination with toothbrushing compared with toothbrushing alone on plaque and gingivitis.

Searching
The authors searched MEDLINE and the Cochrane Central Register of Controlled Trials up to and including December 2007. Search terms were reported. Reference lists of potentially relevant studies and review papers were also searched.

Study selection
To be eligible for the review, studies needed to be randomised controlled clinical trials or controlled clinical trials. Eligible participants were 18 years of age or older and in good general health. Dental flossing and manual toothbrushing had to be compared with a control group using manual toothbrushing only. Interproximal sites needed to be measured and patients should have no orthodontic appliances. Studies lasting four weeks or more were eligible. Only trials written in English were accepted.

There was considerable variation in the study design, characteristics and outcome variables of the included trials. The mean age of the participants was approximately 28 years, ranging from 18 to 70 years. All trials were randomised (four had a crossover design and seven a parallel design) and lasted from four weeks to six months.

A variety of outcome measures were used to assess plaque, gingivitis and bleeding on probing. One trial compared two different kinds of dental floss, six trials used waxed floss and four trials used unwaxed floss. Seven of the trials reported industry funding.

Trials were selected by more than one reviewer and any disagreements between reviewers were resolved by discussion.

Assessment of study quality
The authors based an assessment of methodological quality on method of randomisation, blinding of examiners and completeness of follow-up.

The authors did not state how the validity assessment was performed.

Data extraction
When repeated measures were given, the longest term in the evaluation was used. Mean values and standard deviations (SDs) were obtained from the text, with standard deviations calculated, where necessary, based on the sample size. Data for baseline and end-trial assessments were calculated separately.

Two reviewers performed the data extraction.

Methods of synthesis
Where appropriate, a random-effects meta-analysis was performed and weighted mean differences (WMDs) were
calculated. Clinical heterogeneity was assessed. Statistical heterogeneity was assessed through the $I^2$ statistic.

**Results of the review**

Eleven randomised controlled trials (RCTs) were included in the review (n=559 participants). Different methods of randomisation were used across the trials, but procedures to conceal patient allocation were not mentioned in most of the trials. Ten of eleven trials blinded outcome assessors. Seven of the trials reported no loss to follow-up.

Three of eleven trials showed a statistically significant effect of flossing as an adjunct to toothbrushing on plaque removal. None of the eight trials that assessed gingival inflammation found a significant effect of dental floss over and above toothbrushing alone. One of four trials using the bleeding index as an outcome measure found a significant difference in favour of floss.

Meta-analysis demonstrated that both baseline and end-point scores showed no statistically significant differences between comparison groups for plaque and gingival index outcomes. There was considerable heterogeneity ($I^2=76.4\%$) observed at the end-point for the plaque scores.

**Authors' conclusions**

Dental flossing provided no benefit above and beyond toothbrushing on removing plaque and reducing gingivitis.

**CRD commentary**

The review question was broadly defined in terms of study design, participants, intervention and outcomes. Two databases were searched, supported by the checking of additional references. The exclusion of non-English language papers may have led to language bias. Validity was assessed and data extraction methods documented. Meta-analysis appeared to be appropriate in the subgroups of trials chosen. The authors' conclusions are supported by the evidence provided.

**Implications of the review for practice and research**

**Practice:** The authors stated that routine instruction of flossing in patients with gingivitis is not supported by evidence. The dental professional should determine, on an individual patient basis, whether high quality flossing is an achievable goal.

**Research:** The authors did not state any implications for research.

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