Weak, unreliable evidence suggests flossing plus toothbrushing may be associated with a small reduction in plaque

Abstracted from

Sambunjak D, Nickerson JW, Poklepovic T, Johnson TM, Imai P, Tugwell P,Worthington HV.

Flossing for the management of periodontal diseases and dental caries in adults.
Cochrane Database Syst Rev 2011 Issue 12. Art. No.CD008829.

Address for correspondence: Luisa Fernandez Mauleffinch, Review Group Co-ordinator, Cochrane Oral Health Group, MANDEC, School of Dentistry, University of Manchester, Higher Cambridge Street, Manchester, M15 6FH, UK. E-mail luisa.fernandez@manchester.ac.uk

Question: Is it beneficial to floss in addition to toothbrushing to help prevent dental caries and periodontal disease?

Data sources The Cochrane Oral Health Group Trials Register, the Cochrane Central Register of Controlled Trials (CENTRAL) Medline, Embase, CINAHL, LILACS, ZETOC Conference Proceedings, Web of Science Conference Proceedings, Clinicaltrials.gov and the metaRegister of Controlled Clinical Trials databases were searched. Manufacturers of dental floss were also contacted to identify any trials.

Study selection Randomised controlled trials comparing toothbrushing and flossing with only toothbrushing, in adults were, included. There were no restrictions regarding language or date of publication.

Data extraction and synthesis Two review authors independently assessed risk of bias for the included studies and extracted data. Trial authors were contacted for further details where these were unclear. Meta-analysis was conducted using random-effects models, the main effect measure being standardised mean difference (SMD) with 95% confidence intervals (CI). Potential sources of heterogeneity were examined and a sensitivity analysis conducted omitting trials at high risk of bias.

Results Twelve trials were included in this review. These included a total of 582 participants in flossing plus toothbrushing (intervention) groups and 501 participants in toothbrushing (control) groups. Seven trials had unclear risk of bias and five had high risk of bias. All the trials reported the outcomes of plaque and gingivitis.

Flossing plus toothbrushing showed a statistically significant benefit compared to toothbrushing in reducing gingivitis. Standardised mean differences and 95% confidence intervals are shown for one, three and six month intervals.

	standardised mean difference (SMD)	95% confidence interval
1 month	-0.36	-0.66 to -0.05
3 months	-0.41	-0.68 to -0.14
6 months	-0.72	-1.09 to -0.35

The one month estimate translates to a 0.13 point reduction on a 0 to 3 point scale for Loe-Silness gingivitis index, and the three and six month results translate to 0.20 and 0.09 reductions on the same scale.

Overall there is weak, very unreliable evidence which suggests that flossing plus toothbrushing may be associated with a small reduction in plaque at one or three months. None of the included trials reported data for the outcomes of caries, calculus, clinical attachment loss or quality of life. There was some inconsistent reporting of adverse effects.

Conclusions There is some evidence from 12 studies that flossing in addition to toothbrushing reduces gingivitis compared to toothbrushing alone. There is weak, very unreliable evidence from 10 studies that flossing plus toothbrushing may be associated with a small reduction in plaque at one and three months. No studies reported the effectiveness of flossing plus toothbrushing for preventing dental caries.

This paper is based on a Cochrane Review published in the Cochrane Library 2011, issue 12 (see www.thecochranelibrary.com for information). Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, and the Cochrane Library should be consulted for the most recent version of the review.

Commentary

'Interdental plaque is more prevalent, forms more readily, and is more acidogenic than plaque on the other tooth surfaces in the mouth.[1,2] Therefore, interdental cleansing devices are often recommended as an adjunct to personal oral hygiene. In 1815, a dentist from New Orleans introduced a new method to clean between teeth, using silk dental floss.[3] With the introduction of a more resilient nylon version by Charles Bass around the time of the Second World War, dental floss became a standard in the preventive regimen to maintain good oral health. Despite this, in many industrialised countries, fewer than one in three report flossing on a daily basis.[5] For many, it is a difficult skill to develop, and a challenging behaviour to adopt.

This systematic review by Sambunjak *et al*. is a thoughtful look at the clinical evidence to support the claim that daily flossing will reduce dental plaque and prevent dental caries, gingivitis and periodontal diseases. An exhaustive search for randomised controlled trials comparing toothbrushing and flossing with toothbrushing alone, was conducted. Two review authors independently assessed risk of bias for the included studies. Meta-analysis was conducted using a random-effects models with standardised mean difference (SMD) as the main effect measure. Heterogeneity was explored. Sensitivity analyses were planned to take into account the effect of bias and of the sources of funding.

Twelve trials (1083 participants) reported on outcomes for gingivitis; data from 10 studies were used in the meta-analysis for

plaque reduction. None of the included trials reported data for the reduction in caries, calculus or clinical attachment loss. In terms of reducing gingival inflammation, flossing plus toothbrushing showed a statistically significant benefit compared to toothbrushing alone at the three time points studied. The results were consistent with those at three and six months. Sensitivity analysis excluding studies at high risk of bias did not alter the results in a meaningful way.

Using the GRADE criteria to judge the evidence, studies were determined to be of very low quality. This means we cannot be certain as to the estimate of the effect (from the meta-analysis) of flossing on gingivitis or plaque reduction. None of the studies reported a sample size calculation. None described adequate sequence generation or concealment of the sequence allocation. Thus, seven studies were rated as having an unclear risk of bias and five at high risk of bias. Furthermore, seven studies were sponsored by industry. Two of the five studies that did not disclose sources of funding were both conducted by authors whose affiliations reveal possible or real association with the industry who produced the investigated products. Also, there was concern related to inadequate compliance in many studies and the potential influence of confounders as other possible sources of bias.

Despite the fact that the evidence to support flossing to reduce gingivitis is very low and the evidence to suggest that flossing reduces plaque is unreliable, we must remember that dental diseases are among the most prevalent health conditions. Furthermore, apart from the occasional short-term soft tissue injury, there are no major health risks associated with flossing. As dental professionals we should continue to encourage dental flossing as an important adjunct to oral health self-care, keeping in mind that further research is likely to affect results of future meta-analyses.

Debora Matthews

Department of Dental Clinical Sciences, Faculty of Dentistry, Dalhousie University, Halifax, NS, Canada

1. Lindhe J, Karring T, Lang NP. *Clinical periodontology and implant dentistry.* 4th ed. Copenhagen: Blackwell Munksgaard, 2003.
2. Igarashi K, Lee IK, Schachtele CF. Comparison of in vivo human dental plaque pH changes within artificial fissures and at interproximal sites. *Caries Res* 1989; **23:** 417–422.
3. Parmly LS. *A practical guide to the management of the teeth; comprising a discovery of the origin of caries, or decay of the teeth, with its prevention and cure.* Philadelphia: Collins & Croft, 1819.
4. Bellis, M. History of dentistry and dental care. About.com Guide. http://inventors.about.com/od/dstartinventions/a/dentistry_2.htm Accessed February 13, 2012.
5. Report on the Findings of the Oral Health Component of the Canadian Health Measures Survey 2007–2009. Publications Health Canada, Ottawa, ON, Canada, 2010.

Evidence-Based Dentistry (2012) **13**, 5-6. doi:10.1038/sj.ebd.6400835