The effect of topical fluorides on decalcification in patients with fixed orthodontic appliances: a systematic review

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CRD summary
The authors concluded that different preparations and formulations seem to decrease decalcification, although there was no evidence of a single superior method. The potency of fluoride preparations may be of importance. Limitations in the reporting of the included studies were apparent, although this conclusion reflects the fact that the identified evidence was insufficient to draw any firm conclusions.

Authors' objectives
To determine the effectiveness of topical fluoride preparations in the prevention of decalcification during fixed orthodontic treatment.

Searching
MEDLINE, EMBASE, DARE, the Cochrane Library and the Centre for Reviews and Dissemination Register of Reviews were searched from inception for articles published in all languages. Pertinent journals and proceedings of international meetings were handsearched and manufacturers of fluoride preparations were contacted.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials, clinical trials, and prospective observational studies with concurrent or historical comparison groups were eligible for inclusion.

Specific interventions included in the review
Studies in which topical fluoride was used throughout appliance therapy were eligible for inclusion. Fluoride preparations (stannous fluoride, sodium fluoride, amine fluoride, acidulated phosphofluoride), type of preparation (rinses, gels, solutions) and frequency (twice daily, once daily, three times per week or weekly) varied across the included studies. Some studies compared the potency of the fluoride preparations, whilst some also reported on the consumption of fluoridated water in addition to the use of a fluoride preparation.

Participants included in the review
Studies of patients undergoing orthodontic treatment with fixed appliances were eligible for inclusion. Studies of extracted teeth were excluded.

Outcomes assessed in the review
The studies had to report a valid outcome measure of decalcification before and after orthodontic treatment to be eligible for inclusion. The outcome also had to be clearly defined and reproducible.

How were decisions on the relevance of primary studies made?
Two reviewers assessed titles and abstracts for eligibility, and a third reviewer re-checked all exclusions. Inclusion assessment was piloted on four articles by four reviewers.

Assessment of study quality
No validity assessment was performed.

Data extraction
The data extraction was piloted on four articles by four reviewers. The data were double-extracted and compared for inconsistencies. A third reviewer was contacted in the event of a disagreement. Differences in caries increments between the treatment group and controls were extracted and used to calculate the preventive fraction (PF). The authors stated that the PF should be viewed with extreme caution as there are no confidence intervals.

Methods of synthesis
How were the studies combined?
Differences in methodology and reporting precluded statistical combination of the studies. The studies were therefore described in a narrative.

How were differences between studies investigated?
Differences between the studies were detailed in the narrative and were apparent from the tables.

Results of the review
Six studies (n=1,295) met the inclusion criteria.

All six studies were found to reduce decalcification, with the PF ranging from 30 to 85%. Three of the studies reported a statistically significant reduction in decalcification in patients given active treatment. Two of these studies reported on populations that had consumed fluoridated water.

Several problems were noted in the studies, including variations in the method of reporting results, and a failure to report and analyse confounding factors and to provide a measure of variance that would enable a meta-analysis to be undertaken.

Authors’ conclusions
Different preparations and formats appear to decrease decalcification, although there was no evidence that one method was superior. Some evidence suggested that the potency of fluoride preparations may be of importance.

CRD commentary
The review question was supported by broad inclusion criteria. Several relevant sources were used to identify studies, and attempts were made to limit language and publication bias. Methods were used to minimise reviewer error and bias in the study selection and data extraction processes. A validity assessment was not undertaken, although the authors did detail methodological limitations of the available evidence. On the whole, details of the included studies were poorly reported, particularly with regards to study design and population. This means it is difficult to comment on the strength and reliability of the evidence identified by the review. Differences in fluoride preparations were apparent, and the decision to combine the studies in a narrative seems appropriate. The authors highlighted limitations in the accuracy of the PF, which further weakened the reliability of the evidence presented. In light of these limitations, this review was unable to draw any firm conclusions about the relative efficacy of topical fluorides.

Implications of the review for practice and research
Practice: The authors stated that it was not possible to say which topical preparations or schedules give the most improvement in decalcification.

Research: The authors stated that standard reporting methods, such as the CONSORT (Consolidated Standards of Reporting Trials) guidelines, should be used in future clinical trials.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.