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[Intervention Review]

Fluoride varnishes for preventing dental caries in children and adolescents

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ABSTRACT

Background

Topically-applied fluoride varnishes have been used extensively as an operator-applied caries-preventive intervention for over three decades. This review updates the first Cochrane review of fluoride varnishes for preventing dental caries in children and adolescents, which was first published in 2002.

Objectives

To determine the effectiveness and safety of fluoride varnishes in preventing dental caries in children and adolescents, and to examine factors potentially modifying their effect.

Search methods

We searched the Cochrane Oral Health Group's Trials Register (to 13 May 2013), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2013, Issue 4), MEDLINE via OVID (1946 to 13 May 2013), EMBASE via OVID (1980 to 13 May 2013), CINAHL via EBSCO (1980 to 13 May 2013), LILACS and BBO via the BIREME Virtual Health Library (1980 to 13 May 2013), ProQuest Dissertations and Theses (1861 to 13 May 2013), and Web of Science Conference Proceedings (1945 to 13 May 2013). A search for ongoing trials was undertaken on ClinicalTrials.gov on 13 May 2013. There were no restrictions on language or date of publication in the search of the electronic databases.

Selection criteria

Randomised or quasi-randomised controlled trials with blind outcome assessment used or indicated, comparing topically-applied fluoride varnish with placebo or no treatment in children up to 16 years during at least one year. The main outcome was caries increment measured by the change in decayed, missing and filled tooth surfaces in both permanent (D(M)FS) and primary (d(e/m)fs) teeth.

Data collection and analysis

At least two review authors assessed all search results, extracted data and undertook risk of bias independently. Study authors were contacted for additional information. The primary measure of effect was the prevented fraction, that is the difference in mean caries increments between the treatment and control groups expressed as a percentage of the mean increment in the control group. The caries

increments nearest to three years were used from each included study. Random-effects meta-analyses were performed where data could be pooled. Potential sources of heterogeneity were examined in random-effects meta-regression analyses. Adverse effects information was collected from the included trials.

Main results

Twenty-two trials with 12,455 participants randomised (9595 used in analyses) were included. For the 13 that contributed data for the permanent tooth surfaces meta-analysis, the pooled D(M)FS prevented fraction estimate comparing fluoride varnish with placebo or no treatment was 43% (95% confidence interval (CI) 30% to 57%; P < 0.0001). There was substantial heterogeneity, confirmed statistically (P < 0.0001; I^2 = 75%), however this body of evidence was assessed as of moderate quality. The pooled d(e/m)fs prevented fraction estimate was 37% (95% CI 24% to 51%; P < 0.0001) for the 10 trials that contributed data for the primary tooth surfaces meta-analysis, also with some heterogeneity (P = 0.009; I^2 = 59%). Once again this body of evidence was assessed as of moderate quality. No significant association between estimates of D(M)FS or d(e/m)fs prevented fractions and the pre-specified factors of baseline caries severity, background exposure to fluorides, application features such as prior prophylaxis, concentration of fluoride, frequency of application were found. There was also no significant association between estimates of D(M)FS or d(e/m)fs prevented fractions and the post hoc factors: whether a placebo or no treatment control was used, length of follow-up, or whether individual or cluster randomisation was used, in the meta-regression models. A funnel plot of the trials in the main meta-analyses indicated no clear relationship between prevented fraction and study precision. In both methods, power is limited when few trials are included. There was little information concerning possible adverse effects or acceptability of treatment.

Authors' conclusions

The conclusions of this updated review remain the same as those when it was first published. The review suggests a substantial caries-inhibiting effect of fluoride varnish in both permanent and primary teeth, however the quality of the evidence was assessed as moderate, as it included mainly high risk of bias studies, with considerable heterogeneity.

PLAIN LANGUAGE SUMMARY

Fluoride varnishes for preventing dental caries in children and adolescents

Review question

The main question addressed by this review is how effective the use of fluoride varnish for the prevention of caries in children and adolescents is compared to placebo (a treatment without the active ingredient i.e. fluoride) or no treatment.

Background

Tooth decay (dental caries) is a significant health problem worldwide. It affects not only the vast majority of adults but also children, from 60% to 90% of them. In other words, six to nine children in every 10 are affected by tooth decay. Levels of tooth decay vary both between and within different countries, but it is generally true that children in lower socio-economic groups (measured by income, education and employment) have greater levels of tooth decay. Untreated tooth decay causes progressive destruction of the tops of teeth (crowns) and this is often accompanied by severe pain and suffering. Repairing and replacing decayed teeth is extremely costly in terms of time and money and is a major drain on the resources of healthcare systems.

The prevention of dental caries in children and adolescents is regarded as a priority for dental services and considered more cost-effective than its treatment. Fluoride is a mineral that prevents tooth decay. Fluoride is added to the water supply in many areas. It can also be applied directly to teeth in the form of fluoride varnish. This is applied to first (baby) and permanent teeth (depending on the age of the child) usually by a dental professional from two to four times a year. Because it stays on the surface of the tooth for relatively long periods of time it releases fluoride in an efficient and effective way.

Study characteristics

This review of existing studies was carried out by the Cochrane Oral Health Group and the evidence is current up to 13 May 2013.

In this updated review there are now 22 trials published between 1975 and 2012 in which a total of 12,455 children were randomised to treatment with either fluoride varnish or placebo/no treatment. Study duration ranged from one to five years among included trials (12 of these lasted two years).

Key results

The evidence produced has been found to be of moderate quality due to issues with trial designs. However in the 13 trials that looked at children and adolescents with permanent teeth the review found that the young people treated with fluoride varnish experienced on average a 43% reduction in decayed, missing and filled tooth surfaces. In the 10 trials looking at the effect of fluoride varnish on first or baby teeth the evidence suggests a 37% reduction in decayed, missing and filled tooth surfaces. There was little information concerning possible adverse effects or acceptability of treatment.

Quality of the evidence

The evidence presented is of moderate quality due to issues with trial designs.