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[Intervention Review]

Slow-release fluoride devices for the control of dental decay

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ABSTRACT

Background

Slow-release fluoride devices have been investigated as a potentially cost-effective method of reducing dental caries in people with high risk of disease. This is the second update of the Cochrane Review first published in 2006 and previously updated in 2014.

Objectives

To evaluate the effectiveness and safety of different types of slow-release fluoride devices on preventing, arresting, or reversing the progression of carious lesions on all surface types of primary (deciduous) and permanent teeth.

Search methods

Cochrane Oral Health's Information Specialist searched the following electronic databases: Cochrane Oral Health's Trials Register (to 23 January 2018); the Cochrane Central Register of Controlled Trials (CENTRAL; 2017, Issue 12) in the Cochrane Library (searched 23 January 2018); MEDLINE Ovid (1946 to 23 January 2018); and Embase Ovid (1980 to 23 January 2018). The US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov, and the World Health Organization International Clinical Trials Registry Platform were searched for ongoing trials (23 January 2018). We placed no restrictions on the language or date of publication when searching the electronic databases.

Selection criteria

Parallel randomised controlled trials (RCTs) comparing slow-release fluoride devices with an alternative fluoride treatment, placebo, or no intervention in all age groups. The main outcome measures sought were changes in numbers of decayed, missing, and filled teeth or surfaces (DMFT/DMFS in permanent teeth or dmft/dmfs in primary teeth), and progression of carious lesions through enamel and into dentine.

Data collection and analysis

We conducted data collection and analysis using standard Cochrane review methods. At least two review authors independently performed all the key steps in the review such as screening of abstracts, application of inclusion criteria, data extraction, and risk of bias assessment. We resolved discrepancies through discussions or arbitration by a third or fourth review author.

Main results

We found no evidence comparing slow-release fluoride devices against other types of fluoride therapy.

We found only one double-blind RCT involving 174 children comparing a slow-release fluoride device (glass beads with fluoride were attached to buccal surfaces of right maxillary first permanent molar teeth) against control (glass beads without fluoride were attached to buccal surfaces of right maxillary first permanent molar teeth). This study was assessed to be at high risk of bias. The study recruited children from seven schools in an area of deprivation that had low levels of fluoride in the water. The mean age at the beginning of the study was 8.8 years and at the termination was 10.9 years. DMFT in permanent teeth or dmft in primary teeth was greater than one at the start of the study and greater than one million colony-forming units of *Streptococcus mutans* per millilitre of saliva.

Although 132 children were still included in the trial at the two-year completion point, examination and statistical analysis was performed on only the 63 children (31 in intervention group, 32 in control group) who had retained the beads (retention rate was 47.7% at 2 years). Among these 63 children, caries increment was reported to be statistically significantly lower in the intervention group than in the control group (DMFT: mean difference -0.72, 95% confidence interval (CI) -1.23 to -0.21; DMFS: mean difference -1.52, 95% CI -2.68 to -0.36 (very low-quality evidence)). Although this difference was clinically significant, it only holds true for those children who maintain the fluoride beads; over 50% of children did not retain the beads.

Harms were not reported within the trial report. Evidence for other outcomes sought in this review (progression to of caries lesion, dental pain, healthcare utilisation data) were also not reported.

Authors' conclusions

There is insufficient evidence to determine the caries-inhibiting effect of slow-release fluoride glass beads. The body of evidence available is of very low quality and there is a potential overestimation of benefit to the average child. The applicability of the findings to the wider population is unclear; the study had included children from a deprived area that had low levels of fluoride in drinking water, and were considered at high risk of caries. In addition, the evidence was only obtained from children who still had the bead attached at 2 years (48% of all available children); children who had lost their slow-release fluoride devices earlier might not have benefited as much from the devices.

PLAIN LANGUAGE SUMMARY

Slow-release fluoride devices for the control of dental decay

Review question

We conducted this review to assess the effects of different types of slow-release fluoride devices on preventing, stopping, or reversing the progression of tooth decay on all surface types of deciduous ('baby') and permanent teeth.

Background

Tooth decay is not distributed evenly among the population, with certain groups being at greater risk of developing tooth decay than others. For example, research in Scotland has shown that 50% of tooth decay occurs in 11% of 5-year-old children and only 6% of 14-year-old children. In light of this uneven distribution, it is often suggested that these small percentages of children may be offered targeted-caries preventive measures to great potential effect, in a cost effective manner. One such preventive measure is the use of slow-release fluoride devices (e.g. slow-dissolving fluoride-releasing glass beads).

Study characteristics

Authors from Cochrane Oral Health carried out this review of existing studies and the evidence is current up to 23 January 2018. We searched scientific databases for clinical trials in children or adults treated with slow-release fluoride devices compared with another type of fluoride treatment (e.g. toothpaste, mouthrinse, gel, or varnish), placebo (a pretend treatment), or no treatment (usual care). Treatments had to be used and monitored for a minimum of 1 year.

Key results

We found one study that randomised 174 children to either slow-dissolving, fluoride-releasing glass beads or placebo beads. The setting was an inner city school in an area served with low-fluoride water. Only 48% of children retained the beads and were available for analysis.

There is insufficient evidence to determine whether slow-release fluoride devices (such as glass beads) help reduce dental decay. Retention of the beads is a problem.

Quality of the evidence

The evidence relating caries increment, side effects and retention was considered to be very low quality.