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[Intervention Review]

Direct composite resin fillings versus amalgam fillings for permanent or adult posterior teeth

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ABSTRACT

Background

Amalgam has been the traditional material for filling cavities in posterior teeth for the last 150 years and, due to its effectiveness and cost, amalgam is still the restorative material of choice in certain parts of the world. In recent times, however, there have been concerns over the use of amalgam restorations (fillings), relating to the mercury release in the body and the environmental impact following its disposal. Resin composites have become an esthetic alternative to amalgam restorations and there has been a remarkable improvement of its mechanical properties to restore posterior teeth.

There is need to review new evidence comparing the effectiveness of both restorations.

Objectives

To examine the effects of direct composite resin fillings versus amalgam fillings for permanent posterior teeth, primarily on restoration failure.

Search methods

We searched the Cochrane Oral Health Group's Trials Register (to 22 October 2013), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2013, Issue 9), MEDLINE via OVID (1946 to 22 October 2013), EMBASE via OVID (1980 to 22 October 2013), and LILACs via BIREME Virtual Health Library (1980 to 22 October 2013). We applied no restrictions on language or date of publication when searching the electronic databases. We contacted manufacturers of dental materials to obtain any unpublished studies.

Selection criteria

Randomized controlled trials comparing dental resin composites with dental amalgams in permanent posterior teeth. We excluded studies having a follow-up period of less than three years.

Data collection and analysis

We used standard methodological procedures expected by The Cochrane Collaboration.

Main results

Of the 2205 retrieved references, we included seven trials (10 articles) in the systematic review. Two trials were parallel group studies involving 1645 composite restorations and 1365 amalgam restorations (921 children) in the analysis. The other five trials were split-mouth studies involving 1620 composite restorations and 570 amalgam restorations in an unclear number of children. Due to major problems with the reporting of the data for the five split-mouth trials, the primary analysis is based on the two parallel group trials. We judged all seven trials to be at high risk of bias and we analyzed 3265 composite restorations and 1935 amalgam restorations.

The parallel group trials indicated that resin restorations had a significantly higher risk of failure than amalgam restorations (risk ratio (RR) 1.89, 95% confidence interval (CI) 1.52 to 2.35, P value < 0.001 (fixed-effect model) (low-quality evidence)) and increased risk of secondary caries (RR 2.14, 95% CI 1.67 to 2.74, P value < 0.001 (low-quality evidence)) but no evidence of an increased risk of restoration fracture (RR 0.87, 95% CI 0.46 to 1.64, P value = 0.66 (moderate-quality evidence)). The results from the split-mouth trials were consistent with those of the parallel group trials.

Adverse effects of dental restorations were reported in two trials. The outcomes considered were neurobehavioral function, renal function, psychosocial function, and physical development. The investigators found no difference in adverse effects between composite and amalgam restorations. However, the results should be interpreted with caution as none of the outcomes were reported in more than one trial.

Authors' conclusions

There is low-quality evidence to suggest that resin composites lead to higher failure rates and risk of secondary caries than amalgam restorations. This review reinforces the benefit of amalgam restorations and the results are particularly useful in parts of the world where amalgam is still the material of choice to restore posterior teeth with proximal caries. The review found insufficient evidence to support or refute any adverse effects associated with amalgam or composite restorations. However, emerging research is highlighting issues around genetic susceptibility to mercury. The decision for a global phase-down of amalgam (Minamata Convention on Mercury) will restrict the future use of amalgam.

PLAIN LANGUAGE SUMMARY

Tooth-colored resin fillings compared with amalgam fillings for permanent teeth at the back of the mouth

Review question

This review, carried out by the Cochrane Oral Health Group, addressed the question of how effective tooth-colored (composite resin) fillings are compared with conventional amalgam fillings when placed directly into cavities in permanent teeth in the back of the mouth.

Background

There is controversy over the best materials to use when restoring or filling holes caused by tooth decay in permanent teeth at the back of the mouth. Amalgam fillings have been successfully used for over 150 years and are cost effective. However, their use has declined over recent years partly because of the way they look and because of the perceived risk of mercury that is used in them. Tooth-colored (composite resin) fillings are frequently used in the front teeth and also in permanent teeth at the back of the mouth.

Study characteristics

The evidence on which this review is based was up to date as of 22 October 2013. We searched scientific databases and found seven studies to include in this review comparing composite resin fillings with amalgam fillings and we included two of these studies in the main analysis. There were 3265 composite fillings and 1935 amalgam fillings but it is unclear how many children these were in. The exact age of participants was also unclear in some studies; however, both children and adults with permanent teeth at the back of the mouth that required fillings were included. Study centers were located in the UK, USA, Portugal, Sweden, The Netherlands, Belgium, and Germany.

Key results

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The main result including only two studies in 921 children suggests that amalgam fillings had lower failure rates than tooth-colored (composite resin) fillings used to fill holes caused by decay in permanent teeth at the back of the mouth. Further tooth decay (secondary caries) also occurred less frequently next to or under amalgam fillings compared with composite resin fillings. There was no evidence of a difference in the breaking of the two types of fillings.

The other five studies only reported the rate of failure of the fillings and the amount of further tooth decay occurring next to or under the fillings (secondary caries) and the results supported those of the two studies above.

The results suggest that tooth-colored (composite resin) fillings are almost twice as likely to fail compared with amalgam fillings when used for filling permanent teeth at the back of the mouth.

Quality of the evidence

The quality of the evidence was low to moderate. Because there was an obvious difference in the color of the fillings, it was not possible to do the comparisons 'blind' so there was, therefore, a high risk of bias.