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[Intervention Review]

Materials for retrograde filling in root canal therapy

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ABSTRACT

Background

Root canal therapy is a sequence of treatments involving root canal cleaning, shaping, decontamination and obturation. It is conventionally performed through a hole drilled into the crown of the affected tooth, namely orthograde root canal therapy. For teeth that cannot be treated with orthograde root canal therapy, or for which it has failed, retrograde root filling, which seals the root canal from the root apex, is a good alternative. Many materials, such as amalgam, zinc oxide eugenol and mineral trioxide aggregate (MTA), are generally used. Since none meets all the criteria an ideal material should possess, selecting the most efficacious material is of utmost importance.

Objectives

To determine the effects of different materials used for retrograde filling in children and adults for whom retrograde filling is necessary in order to save the tooth.

Search methods

Cochrane Oral Health's Information Specialist searched the following databases: Cochrane Oral Health's Trials Register (to 13 September 2016); the Cochrane Central Register of Controlled Trials (CENTRAL; 2016, Issue 8) in the Cochrane Library (searched 13 September 2016); MEDLINE Ovid (1946 to 13 September 2016); Embase Ovid (1980 to 13 September 2016); LILACS BIREME Virtual Health Library (1982 to 13 September 2016); and OpenSIGLE (1980 to 2005). ClinicalTrials.gov and the [World Health Organization International Clinical Trials Registry Platform](http://WorldHealthOrganizationInternationalClinicalTrialsRegistryPlatform) were searched for ongoing trials. We also searched Chinese BioMedical Literature Database (in Chinese, 1978 to 20 September 2016); VIP (in Chinese, 1989 to 20 September 2016); China National Knowledge Infrastructure (in Chinese, 1994 to 20 September 2016); and Sciencepaper Online (in Chinese, to 20 September 2016). No restrictions were placed on the language or date of publication when searching the electronic databases.

Selection criteria

We selected randomised controlled trials (RCTs) only that compared different retrograde filling materials, with reported success rate that was assessed by clinical or radiological methods for which the follow-up period was at least 12 months.

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Data collection and analysis

Two review authors extracted data independently and in duplicate. Original trial authors were contacted for any missing information. Two review authors independently carried out risk of bias assessments for each eligible study following Cochrane methodological guidelines.

Main results

We included six studies (916 participants with 988 teeth) reported in English. All the studies had high risk of bias. The six studies examined five different comparisons, including MTA versus intermediate restorative material (IRM), MTA versus super ethoxybenzoic acid cement (Super-EBA), Super-EBA versus IRM, dentine-bonded resin composite versus glass ionomer cement and glass ionomer cement versus amalgam. There was therefore little pooling of data and very little evidence for each comparison.

There is weak evidence of little or no difference between MTA and IRM at the first year of follow-up (risk ratio (RR) 1.09; 95% confidence interval (CI): 0.97 to 1.22; 222 teeth; quality of evidence: low). Insufficient evidence of a difference between MTA and IRM on success rate at the second year of follow-up (RR 1.06; 95% CI: 0.89 to 1.25; 86 teeth, 86 participants; quality of evidence: very low). All the other outcomes were based on a single study. There is insufficient evidence of any difference between MTA and Super-EBA at the one-year follow-up (RR 1.03; 95% CI: 0.96 to 1.10; 192 teeth, 192 participants; quality of evidence: very low), and only weak evidence indicating there might be a small increase in success rate at the one-year follow-up in favour of IRM compared to Super-EBA (RR 0.90; 95% CI: 0.80 to 1.01; 194 teeth; quality of evidence: very low). There was also insufficient and weak evidence to show that dentine-bonded resin composite might be a better choice for increasing retrograde filling success rate compared to glass ionomer cement at the one-year follow-up (RR 2.39; 95% CI: 1.60 to 3.59; 122 teeth, 122 participants; quality of evidence: very low). And there was insufficient evidence of a difference between glass ionomer cement and amalgam at both the one-year (RR 0.98; 95% CI: 0.86 to 1.12; 105 teeth; quality of evidence: very low) and five-year follow-ups (RR 1.00; 95% CI: 0.84 to 1.20; 82 teeth; quality of evidence: very low).

None of these studies reported an adverse event.

Authors' conclusions

Based on the present limited evidence, there is insufficient evidence to draw any conclusion as to the benefits of any one material over another. We conclude that more high-quality RCTs are required.

PLAIN LANGUAGE SUMMARY

Materials for retrograde filling in root canal therapy

Review question

This review examined the effects of different materials used for retrograde filling in children and adults for whom this treatment is necessary in order to save the tooth.

Background

The living part of the tooth, also known as the tooth pulp, can become irreversibly inflamed as a result of damage or bacterial infection due to tooth decay. To deal with this problem, the dentist has to drill a hole to access the inner space of the tooth or root canal system, and remove the infected tissue and toxic irritants by a combination of mechanical cleaning and irrigation. After this is done, the dentist fills the space with an inert packing material and seals the opening. This procedure is known as root canal therapy. Although results are generally good, a small number of failures do occur. This may be attributed to the complexity of the root canal system, which has many small additional pathways communicating with each other, making it difficult to completely eliminate all of the toxins and irritants. These can spread, causing the infection around the root to last indefinitely. When root canal therapy fails, a retreatment called retrograde filling is a good alternative to save the tooth. During retrograde filling the dentist cuts a flap in the gum and creates a hole in the bone to get access to the bottom tip of the root. After cutting off the tip, then thorough preparation, the apex is sealed (the apical seal) and the hole made by the dentist filled with a dental material. This sealing process is thought to be the single most important factor in achieving success in a retrograde root filling. Many materials have been developed to seal the root tip, mineral trioxide aggregate is the material of interest at present, but there is no consensus about which material is best.

Study characteristics

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The evidence in this review, which was carried out together with Cochrane Oral Health, is up-to-date as of 13th September 2016. We included six studies that evaluated 916 participants and 988 teeth, who were undergoing retrograde filling using different types of filling material: mineral trioxide aggregate (MTA), intermediate restorative material (IRM), super ethoxybenzoid acid (Super-EBA), dentine-bonded resin composite, glass ionomer cement, and amalgam. Five studies were conducted in Europe and one in Asia. Studies measured the success rate with clinical or radiological methods. None of the studies reported possible side effects.

Key results

The limited evidence is insufficient to draw any conclusion as to the benefits of any one material over another, so we are not able to recommend which material is best to use in retrograde filling at present.

Quality of the evidence

The evidence presented is of very low quality due to the small amount of available studies, all at high risk of bias, results were imprecise and may not be applicable to other settings/countries.