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[Intervention Review]

# Atraumatic restorative treatment versus conventional restorative treatment for managing dental caries

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## ABSTRACT

### Background

Dental caries is a sugar-dependent disease that damages tooth structure and, due to loss of mineral components, may eventually lead to cavitation. Dental caries is the most prevalent disease worldwide and is considered the most important burden of oral health. Conventional treatment methods (drill and fill) involve the use of rotary burs under local anaesthesia. The need for an electricity supply, expensive handpieces and highly trained dental health personnel may limit access to dental treatment, especially in underdeveloped regions.

To overcome the limitations of conventional restorative treatment, the Atraumatic Restorative Treatment (ART) was developed, mainly for treating caries in children living in under-served areas of the world where resources and facilities such as electricity and trained manpower are limited. ART is a minimally invasive approach which involves removal of decayed tissue using hand instruments alone, usually without use of anaesthesia and electrically driven equipment, and restoration of the dental cavity with an adhesive material (glass ionomer cement (GIC), composite resins, resin-modified glass-ionomer cement (RM-GICs) and compomers).

### Objectives

To assess the effects of Atraumatic Restorative Treatment (ART) compared with conventional treatment for managing dental caries lesions in the primary and permanent teeth of children and adults.

### Search methods

Cochrane Oral Health's Information Specialist searched the following databases: Cochrane Oral Health's Trials Register (to 22 February 2017), the Cochrane Central Register of Controlled Trials (CENTRAL) (the Cochrane Library, 2017, Issue 1), MEDLINE Ovid (1946 to 22 February 2017), Embase Ovid (1980 to 22 February 2017), LILACS BIREME Virtual Health Library (Latin American and Caribbean Health Science Information database; 1982 to 22 February 2017) and BBO BIREME Virtual Health Library (Bibliografía

Brasileira de Odontologia; 1986 to 22 February 2017). The US National Institutes of Health Trials Registry (ClinicalTrials.gov) and the World Health Organization International Clinical Trials Registry Platform were searched for ongoing trials. No restrictions were placed on the language or date of publication when searching the electronic databases.

### **Selection criteria**

We included randomised controlled trials (RCTs) with at least six months' follow-up that compared the effects of ART with a conventional restorative approach using the same or different restorative dental materials to treat caries lesions.

### **Data collection and analysis**

Two review authors independently screened search results, extracted data from included studies and assessed the risk of bias in those studies. We used standard methodological procedures expected by Cochrane to evaluate risk of bias and synthesise data. Where pooling was appropriate we conducted meta-analyses using the random-effects model. We assessed the quality of the evidence using GRADE criteria.

### **Main results**

We included a total of 15 eligible studies randomising 3760 participants in this review. The age of participants across the studies ranged from 3 to 101 years, with a mean of 25.42 years. 48% of participants were male. All included studies were published between 2002 and 2016. Two of the 15 studies declared that the financial support was from companies that manufacture restorative material. Five studies were individually randomised parallel-group studies; six were cluster-randomised parallel-group studies; and four were randomised studies that used a split-mouth design. Eleven studies evaluated the effects of ART on primary teeth only, and four on permanent teeth. The follow-up period of the included studies ranged from 6 months to 36 months. We judged all studies to be at high risk of bias.

For the main comparison of ART compared to conventional treatment using the same material: all but two studies used high-viscosity glass ionomer (H-GIC) as the restorative material; one study used a composite material; and one study used resin-modified glass ionomer cement (RM-GIC)).

Compared to conventional treatment using H-GIC, ART may increase the risk of restoration failure in the primary dentition, over a follow-up period from 12 to 24 months (OR 1.60, 95% CI 1.13 to 2.27, five studies; 643 participants analysed; low-quality evidence). Our confidence in this effect estimate is limited due to serious concerns over risk of performance and attrition bias. For this comparison, ART may reduce pain during procedure compared with conventional treatment (MD -0.65, 95% CI -1.38 to 0.07; 40 participants analysed; low-quality evidence)

Comparisons of ART to conventional treatment using composite or RM-GIC were downgraded to very low quality due to indirectness, imprecision and high risk of performance and attrition bias. Given the very low quality of the evidence from single studies, we are uncertain about the restoration failure of ART compared with conventional treatment using composite over a 24-month follow-up period (OR 1.11, 95% CI 0.54 to 2.29; one study; 57 participants) and ART using RM-GIC in the permanent teeth of older adults with root caries lesions over a six-month follow-up period (OR 2.71, 95% CI 0.94 to 7.81; one study; 64 participants).

No studies reported on adverse events or costs.

### **Authors' conclusions**

Low-quality evidence suggests that ART using H-GIC may have a higher risk of restoration failure than conventional treatment for caries lesions in primary teeth. The effects of ART using composite and RM-GIC are uncertain due to the very low quality of the evidence and we cannot rely on the findings. Most studies evaluated the effects of ART on the primary dentition.

Well-designed RCTs are required that report on restoration failure at clinically meaningful time points, as well as participant-reported outcomes such as pain and discomfort. Due to the potential confounding effects from the use of different dental materials, a robust body of evidence on the effects of ART compared with conventional treatment using the same restoration material is necessary. We identified four ongoing trials that could provide further insights into this area.

## **PLAIN LANGUAGE SUMMARY**

### **Atraumatic restorative treatment (hand instruments only) compared with conventional treatment for managing tooth decay**

#### **Review question**

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Atraumatic restorative treatment versus conventional restorative treatment for managing dental caries (Review)  
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The aim of this review is to evaluate the effects of a minimally invasive approach, namely Atraumatic Restorative Treatment (ART), for the treatment of tooth decay in children and adults (primary and permanent teeth).

### **Background**

Dental caries (tooth decay) has been considered the most common global disease. Conventional methods (drill and fill) involve the use of electric drills to clear away decayed areas of tooth before filling. Local anaesthetic (painkiller) is normally injected to prevent pain during the procedure. Conventional treatments require highly trained dental health personnel, access to electricity, appropriate tools and are more expensive. These factors may limit access especially in underdeveloped regions of service provision.

Atraumatic Restorative Treatment (ART) is an alternative approach for managing dental decay, which involves removal of decayed tissue using hand instruments alone, usually without the use of anaesthesia (injected painkiller) and electrical equipment.

### **Study characteristics**

This review searched the available evidence that was up to date at 22 February 2017. We found 15 relevant studies including 3760 participants with an average age of 25 years (range 3 to 101) where 48% were male. The follow-up period in the trials ranged from 6 to 36 months. Two of the 15 studies declared financial support from companies that made tooth-filling material. In addition, we found four ongoing studies.

### **Key results**

There is low-quality evidence to suggest that primary teeth treated with the ART approach using high viscosity glass ionomer cement may be more likely than those receiving conventional treatment with the same material to result in restoration failure. In the treatment of primary teeth, ART may reduce pain experience compared with conventional treatment. The evidence available for evaluating the differences between ART and conventional treatments using other restorative materials or in permanent teeth is very low quality so we cannot draw any conclusions. None of the included studies reported on negative side effects or costs.

### **Quality of the evidence**

The available evidence is low- to very low-quality. It is likely that further high-quality research may change our findings. There are four ongoing studies that may provide more information in the future.