The atraumatic restorative treatment (ART) approach for managing dental caries: a meta-analysis
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CRD summary
This review concluded that survival rates are high for single-surface atraumatic restorative treatment restorations in primary and permanent teeth, and that survival is better with high-viscosity than with medium-viscosity glass-ionomers. Survival rates of multiple-surface restorations in primary teeth are low. It is unclear whether the results of the included studies and their subsequent synthesis can be relied upon.

Authors’ objectives
To assess the survival of atraumatic restorative treatment (ART) restorations in primary and permanent teeth and the retention and caries preventive effect of ART sealants in permanent teeth.

Searching
MEDLINE and PubMed were searched up to 1 June 2005 for English language studies and the references of retrieved publications were checked. The search terms were provided.

Study selection
Study designs of evaluations included in the review
The inclusion criteria for study design were not specified.

Specific interventions included in the review
Studies of ART restorations or sealants were eligible for inclusion provided the treatment was delivered by a graduate dentist or dental therapist. The included studies used high-viscosity or medium-viscosity glass-ionomers, the former being more commonly used.

Participants included in the review
Participants with primary or permanent teeth were eligible for inclusion. In the included studies of primary teeth most of the participants were over 6 years old.

Outcomes assessed in the review
Studies reporting sealant or restoration survival for more than 1 year were eligible for inclusion. Studies were excluded if they reported an incorrect statistical analysis though it was unclear how this was defined. The majority of included studies used ART criteria for evaluating survival (further details not provided).

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
Two investigators independently extracted the data and any disagreements were resolved through discussion and consensus. Survival percentages and 95% confidence intervals (CIs) were extracted and the standard error was calculated. The numbers of sealants/restorations were also extracted.
Methods of synthesis
How were the studies combined?
The studies were statistically pooled and individually weighted, based on the reciprocal of the standard error.

How were differences between studies investigated?
Studies of primary and secondary teeth were pooled separately, with further stratification based on whether they were single- or multiple-surface restorations and whether high- and medium-viscosity glass-ionomers had been used. The survival of the two materials was compared using the t-test.

Results of the review
Twenty-one studies were included. The number of participants and the study design were not reported though the studies appeared to be observational studies with no control group.

Primary teeth.
For single-surface ART restorations using high-viscosity glass-ionomers (7 studies), the weighted mean survival was 95% (95% CI: 94, 97) at 1 year and 91% (95% CI: 88, 93) at 2 years. One-year survival with medium-viscosity ionomers (1 study) was 79% (95% CI: 70, 86). For multiple-surface ART restorations using high- viscosity glass-ionomers (7 studies), the weighted mean survival was 73% (95% CI: 70, 77) at 1 year and 59% (95% CI: 55, 64) at 2 years. One-year survival with medium-viscosity ionomers (1 study) was 55% (95% CI: 46, 63). Mean survival rates were statistically significantly higher for single-surface compared with multiple-surface restorations after 1 and 2 years.

Permanent teeth.
For single-surface restorations with high-viscosity glass-ionomers (9 to 10 studies), the weighted mean survival was 97% (95% CI: 97, 98) at 1 year and 94% (95% CI: 92, 95) at 2 years. Survival with medium-viscosity ionomers (3 to 4 studies) was 95% (95% CI: 93, 97) at 1 year and 91% (95% CI: 88, 93) at 2 years. The authors stated that the difference between medium- and high-viscosity ionomers was statistically significant. The mean survival rates for partially and fully retained ART sealants were 76% (95% CI: 72, 79) for medium-viscosity and 90% (95% CI: 87, 93) for high-viscosity ionomers at 1 year (2 studies each). The difference between the two types of glass-ionomers was statistically significant (p=0.013). The mean annual caries rate in previously sealed pits and fissures using high-viscosity glass-ionomers via the press-finger technique was 1% over the first 3 years (2 studies).

Authors' conclusions
Survival rates are high for single-surface ART restorations in primary and permanent teeth, while mean survival rates are higher with high-viscosity than with medium-viscosity glass-ionomers during the first 3 years. The survival rates of multiple-surface restorations in primary teeth are low.

CRD commentary
There were clearly stated inclusion criteria for the interventions and participants. There is a strong possibility that relevant studies were missed as only one electronic database (MEDLINE and PubMed are a single linked database) was searched and only English language studies were included. An appropriate method was used to reduce error and bias in the extraction of data but it is unclear whether a similar approach was used when selecting the studies. The quality of the included studies was not assessed and the results of the included studies were not considered in the context of study quality. Details of the included studies were limited: in particular, it is unclear how many participants there were and how survival was assessed in the individual studies. It seems appropriate to have stratified the analysis. However, the authors' conclusions about single- versus multiple-surface ART restorations and medium- versus high-viscosity glass-ionomers might not be reliable as they are based on indirect comparisons of uncontrolled studies rather than head-to-head comparisons of the interventions. Given the limitations of the review, the authors' conclusions might not be reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that further studies are required to assess the retention and caries prevention effect of ART sealants.

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