The effectiveness of sealants in managing caries lesions
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CRD summary
The authors concluded that sealing non-cavitated caries in the pits and fissures of permanent teeth in children, adolescents and young adults was effective in reducing caries progression. The authors' conclusions reflected the results of the review, but some caution was needed given the small number of studies and incomplete reporting of review methods.

Authors' objectives
To determine the effectiveness of dental sealants in preventing the progression of caries lesions in the pits and fissures of permanent teeth.

Searching
MEDLINE (1966 to June 2005), EMBASE (1980 to June 2005) and Cochrane Central Register of Controlled Trials (1st week September 2005) were searched for English language articles using a modified search strategy used by the National Institutes of Health (NIH) Caries Consensus Development Conference. References of retrieved articles were handsearched.

Study selection
Randomised or non-randomised controlled trials or cohort studies measuring the effectiveness of dental sealants on caries progression in permanent teeth were eligible for inclusion. Included studies were of a variety of resin-based and glass-isomer cement (GIC) sealants.

Most included studies were of participants with non-cavitated lesions. The age of participants ranged from six years to 19 years. Included studies were of caries progression defined as demineralisation or loss of tooth structure as measured by direct digital radiography, visual-tactile examination or the Bodecker device. Included studies were from the USA, Canada, Brazil and Zimbabwe.

Two reviewers independently assessed the titles and abstracts to identify articles to retrieve in full text. One reviewer examined all full text articles to identify studies potentially eligible for inclusion. Three reviewers assessed the shortlisted articles to select studies to be included in the review.

Assessment of study quality
Validity was assessed jointly by three reviewers using the following criteria determined by the third US Preventative Services Task force: method of assembling the comparator groups; clarity of definition of the intervention; reliability and validity of outcome measure; and loss to follow up. Each study was awarded an overall rating of study quality.

Data extraction
Data were extracted by two reviewers using a modified version of a form developed by the NIH Caries Consensus Conference. The median percentage of lesions progressing in sealed and unsealed teeth were extracted for each study. The relative risk ratio (RR) and corresponding 95% confidence intervals (CI) were calculated by dividing the percentage of lesions progressing in sealed teeth by the percentage of lesions progressing in unsealed teeth. The prevented fraction and corresponding 95% CIs were obtained for each study by subtracting the RR and its corresponding CIs from 1.

Methods of synthesis
Results were combined in a meta analysis by calculating the median percentage of lesions progressing and the median prevented fraction for sealed and unsealed surfaces across all studies. The pooled RR with 95% CIs was calculated using the DerSimonian and Laird random-effects model. The data was adjusted for differences in study design, multiple observations per subject and 100 per cent or 0 per cent progression rates. The summary prevented fraction and corresponding 95% CI was calculated. Homogeneity was assessed using the $I^2$ statistic. Sensitivity analyses were
conducted excluding cohort studies and assuming higher values of intra-oral correlation.

Results of the review
Six studies were included. The authors stated that they included an estimated 384 patients, 840 teeth and 1,090 surfaces (none of the studies appeared to report all three of these units). Four RCTs (approximately 140 patients) and one prospective and one retrospective cohort study were included. All studies were rated as fair on the validity assessment. One study had a high loss to follow up and three studies did not have blinded outcome assessment.

Caries progression in sealed lesions (median annualised progression rate 5 per cent) was lower than in unsealed lesions (median annualised progression rate 16.1 per cent). Sealing caries lesions reduced the likelihood of lesion progression by more than 70 per cent (summary prevented fraction was 73.2%, 95% CI 59.8 to 82.2 assuming perfect correlation between teeth or 75 per cent, 95% CI 67.1 to 81.1 assuming no correlation between teeth).

When only the RCTs were analysed, the summary prevented fraction remained above 70 per cent (four studies: summary prevented fraction 71.2%, 95% CI: 50.3, 83.3 assuming a correlation of 1). When only non-cavitated lesions were considered the median annualised progression rates for sealed lesions was 2.6% compared with 12.6% in unsealed lesions.

There was no evidence of statistical heterogeneity for any outcomes.

Authors' conclusions
Sealing non-cavitated caries in the pits and fissures of permanent teeth in children, adolescents and young adults was effective in reducing caries progression.

CRD commentary
The review addressed a clear question with well-defined inclusion criteria. Three relevant databases were searched, but only for studies published in English, which may have introduced language bias. No search for unpublished data appeared to have been carried out, therefore, publication bias could not be ruled out. Attempts were made to minimise reviewer errors and bias in some but not all parts of the review process, so reviewer error and bias cannot be ruled out. Study validity was assessed and results were discussed.

It was questionable whether pooling data from studies with different designs was appropriate for the main analysis. However, RCTs were analysed separately and generally provided similar results. Statistical heterogeneity was assessed and various sensitivity analyses were conducted.

The authors’ conclusions reflected the results of the review, but the small number of studies and incomplete reporting of review methods undermined the robustness of the conclusions.

Implications of the review for practice and research
Practice: The authors stated that the placement of sealants in early or uncertain carious stages was supported. The low rates of progression for unsealed non-cavitated lesions meant that immediate surgical treatment of these lesions may not be necessary.

Research: The authors stated that further studies were needed that meet current standards in terms of design, conduct and reporting, particularly in cavitated lesions. Uniform criteria to assess the progression of cavitation and uniform methodologies to measure the progression of cavitation were needed.

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