Clinical Interventions: Pit and fissure sealants

Systematic Reviews - effectiveness

Author **Ahovuo-Saloranta A, Hiiri A, Norblad A, *et al.***

Title **Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents. *Cochrane Database of Systematic Reviews* 2008; Issue 4: Art No. CD001830.DOI:10.1002/14651858.CDO001830.pub3.**

<table>
<tr><th>Study Type</th><th>Evidence Level</th><th>No. of included studies</th><th>Patient characteristics</th><th>No. of patients included in meta analysis</th><th>Duration of included studies</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr><td rowspan="5">Systematic review of RCTs or quasi-randomised trials</td><td rowspan="5">1++</td><td rowspan="5">16 studies
13 split-mouth
3 parallel</td><td rowspan="5">Children and adolescents under the age of 20 years
Participants Exposed to fluoridated water in 5 studies</td><td rowspan="5">Not reported</td><td rowspan="5">1-9 years</td><td>Resin sealant</td><td>No sealant</td><td>Caries Yes/No on occlusal surfaces of permanent molar teeth
Caries defined as caries into dentine</td><td>Resin FS vs No sealant (7 studies)<table><tr><th>Time mths</th><th>RR</th><th>(95% CI)</th><th>% caries reduction</th><th>No. studies</th></tr><tr><td>12</td><td>0.13</td><td>0.09-0.20</td><td>87%</td><td>3</td></tr><tr><td>24</td><td>0.22</td><td>0.15-0.34</td><td>78%</td><td>3</td></tr><tr><td>36</td><td>0.30</td><td>0.22-0.40</td><td>70%</td><td>3</td></tr><tr><td>48-54</td><td>0.40</td><td>0.31-0.51</td><td>60%</td><td>3</td></tr><tr><td>108</td><td>0.35</td><td>0.22-0.55</td><td>65%</td><td>1</td></tr></table></td></tr>
<tr><td>Glass ionomer</td><td>No sealant</td><td></td><td>1 study – non significant result</td></tr>
<tr><td>Resin sealant</td><td>Glass ionomer</td><td></td><td>Resin sealant v Glass ionomer sealant (8 studies)
3 studies: resin better caries reductions than GI
2 studies: GI better caries reductions than resin
3 studies: no difference in caries reductions between materials</td></tr>
<tr><td>Resin sealant</td><td>Compomer</td><td></td><td>Resin sealant v Compomer at 24 months (2 studies)
No difference in caries reductions between the materials</td></tr>
<tr><td></td><td></td><td>Secondary outcome: sealant retention</td><td>Sealant vs No treatment
Complete Retention ranged from:
79% to 92% at 12 months
71% to 85% at 24 months
61% to 80% at 36 months
52% at 48 months72% at 54 months
39% at 9 years (with reapplication up to 36 months)</td></tr>
</table>

Author **Ahovuo-Saloranta A, Hiiri A, Norblad A, *et al.***

Title **Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents. *Cochrane Database of Systematic Reviews* 2008; Issue 4: Art No. CD001830.DOI:10.1002/14651858.CDO001830.pub3.**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
									Resin sealant v **Glass ionomer sealant** 4 studies: retention with resin better than GI 3 studies: low retention reported for both types of sealant **Resin sealant** v **Compomer** 1 study: Complete retention of over 70% for both materials 1 study: Complete retention 16% for compomer and 66% for resin

Author conclusions: Sealing is a recommended procedure to prevent caries of the occlusal surfaces of permanent molars. The effectiveness of sealants is obvious at high caries risk but information on the benefit of sealing related to different caries risks is lacking. More research is needed on the effectiveness of sealants at different caries risk levels and to clarify the relative effectiveness of different sealant materials.

Reviewer comments: The review update added 8 new studies to the review. Overall, the clinical conclusions were unchanged from the previous version of the review.

Author **Ahovuo-Saloranta A, Hiiri A, Norblad A *et al.***

Title **Pit and Fissure sealants for preventing dental decay in the permanent teeth of children and adolescents, 2004. *The Cochrane Database of Systematic Reviews* Issue 4, Art. No.: CD001830. DOI: 001810.001002/14651858.CD14001830.pub14651853.**

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<tr><th>Study Type</th><th>Evidence Level</th><th>No. of included studies</th><th>Patient characteristics</th><th>No. of patients included in meta analysis</th><th>Duration of included studies</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr><td rowspan="4">Systematic review of RCTs or quasi-randomised trials</td><td rowspan="4">1++</td><td rowspan="4">8 studies
7 split-mouth
1 parallel</td><td rowspan="4">The age range of children in the included studies was from 5-13 years, recruited from selected schools or dental clinics.</td><td rowspan="4">Not reported</td><td rowspan="4"></td><td>Resin sealant</td><td>No treatment</td><td>Caries Yes/No at various time points</td><td><table><tr><th>Time mths</th><th>RR</th><th>(95% CI)</th><th>% caries reduction</th><th>No. studies</th></tr><tr><td>12</td><td>0.14</td><td>0.09- 0.19</td><td>86%</td><td>3</td></tr><tr><td>24</td><td>0.24</td><td>0.23-0.30</td><td>76%</td><td>3</td></tr><tr><td>36</td><td>0.30</td><td>0.26-0.35</td><td>70%</td><td>3</td></tr><tr><td>48-54</td><td>0.43</td><td>0.37-0.50</td><td>57%</td><td>2</td></tr></table>The caries-preventive effect of the resin-based sealants declined over time.</td></tr>
<tr><td>Glass ionomer</td><td>No treatment</td><td>mean difference</td><td>1 study – non significant result</td></tr>
<tr><td>Glass ionomer</td><td>Resin sealant</td><td>Caries Yes/No at various time points</td><td>3 studies were involved in this comparison, and the findings were conflicting. One study favoured glass ionomer sealant and the two others favoured resin sealant. As the results of the studies were so extreme, no meta analysis was attempted.</td></tr>
<tr><td>Any sealant</td><td></td><td>Sealant retention</td><td>Complete retention of resin-based sealant ranged from 79 – 92% at 12 months to 71% -85% at 24 months and 61% -80% at 36 months.
Retention of glass ionomer sealant ranged from <1% to 9% at 24 months and 3% at 36 months</td></tr>
<tr><td colspan="10">Author conclusions: Sealing is a recommended procedure to prevent caries of the occlusal surfaces of permanent molars. However, we recommend that the caries prevalence level of both individuals and the population should be taken into account. Only 2 studies in the review reported baseline levels of caries, so it was not possible to analyse if this has an effect on sealant retention. Future: The methodological quality of published studies concerning pit and fissure sealants was poorer than expected. Further research in the area of fissure sealants should comply with current criteria for RCTs (CONSORT statement) and include baseline level of caries, exposure to fluoride and other preventive measures. More research is needed to clarify the effectiveness of glass ionomer sealants.</td></tr>
</table>

Author **Hiiri A, Ahovuo-Saloranta A, Norblad A, *et al.***

Title **Pit and fissure sealants versus fluoride varnishes for preventing dental decay in children and adolescents. *Cochrane Database of Systematic Reviews* 2009. Issue 2. Art No. CD003067.DOI:10.1002/14651858.CD003067.pub2**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review of RCTs or quasi-randomised trials	1+	4 1 cluster randomised parallel trial (Bravo 2005) 1 parallel (Florio 2001) 2 split mouth (Raadal 1984, Spleith 2001)	Age 5–9 years Exposure to F water in 1 study. School F mouthrinsing and F tablets recommended in 1 study. Motivation and DHE in 3 studies	No meta analysis conducted	1-9 years	FS FS and fluoride Varnish	Floride Varnish (Duraphat) Fluoride Varnish (Duraphat)	Risk ratio for difference in caries on occlusal surfaces	**FS v Varnish (3 studies)** **Duration** / **RR (95% CI)** Bravo, 2005 N=75 children: 4 years 0.42 (0.21, 0.84); 9 years 0.48 (0.29, 0.79) In favour of sealant Florio, 2001* N=23 children: 12 mths 0.22 (0.01, 4.06) Difference NS Raadal, 1984 N=121: 23 mths 0.74 (0.58, 0.95) In favour of sealant *FS was RMGIC **FS + Varnish v Varnish** Duration / RR (95% CI) Spleith, 2001 N=98 children: 24 mths 0.36 (0.21, 0.61) In favour of FS+varnish
								Secondary outcome: Number of visits to repair sealants or to apply varnish	**No. visits/applications** FS group / Varnish group Bravo, 2005^: 2.2 visits (SD1.1) / 7.3 visits (SD1.0) Raadal, 1984,: 1 application / 4 applications Florio, 2001: 1 application / 2 application Spleith, 2001: 29 min tx time / 9 min tx time ^no. visits during active phase

Author **Hiiri A, Ahovuo-Saloranta A, Norblad A, *et al.***

Title **Pit and fissure sealants versus fluoride varnishes for preventing dental decay in children and adolescents. *Cochrane Database of Systematic Reviews* 2009. Issue 2. Art No. CD003067.DOI:10.1002/14651858.CD003067.pub2**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
								Sealant Retention	Sealant retention Duration / Complete retention Bravo, 2005: 4 years 63%; 9 years 39% Raadal, 1984,: 23 mths 63% Florio, 2001: 12 mths 66% Spleith 2001*: 24mths 81% *sealants repaired during study

Authors' conclusion: There is some evidence about the superiority of pit and fissure sealants over fluoride varnish application, but the extent was not determined. No recommendations for the clinical practice could be given and the benefit of pit and fissure sealants and varnish should be considered locally and individually. More high quality studies are required to confirm to what extent there is a difference in the effectiveness of the pit and fissure sealants and fluoride varnishes. The carry over effect of the fluoride varnish in the split mouth study cannot be totally ruled out. Therefore parallel studies are recommended.

Reviewer comment: Insufficient trials to conduct heterogeneity and sensitivity analyses could not be conducted.

Author **Llodra J C, Bravo M, Delgado-Rodriguez, M *et al.***

Title **Factors influencing the effectiveness of sealants: a meta-analysis. *Community Dent Oral Epidemiol* 1993; 21: 261–8.**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review	1+	24 studies reported in 36 articles	Age range of children at start of trials 5-15 yrs	Not reported	3-120 mths	UV light-cured sealant or autopolymerised sealant applied to permanent teeth (mostly first permanent molar)	No treatment.		Autopolymerised sealant significantly more effective than UV light-cured sealant PF 71.4% (95% CI 73.3 – 81.4) v 45.9% (95% CI 43.5 – 48.2 Effectiveness decreases over time for both types of sealant Effectiveness increased when water was fluoridated (PF 82.7% v 71.3%) There was significant heterogeneity between studies and evidence of publication bias.

Author conclusions: Fissure sealants are effective in preventing caries. Their effectiveness decreases with time and periodic reapplication is advisable. There appears to be a positive interaction between fluoride in the drinking water and fissure sealants in preventing caries.

Reviewer comment: All but one of the included studies was carried out in the 1970s

Author **Mejare I, Lingstrom P, Petersson L *et al.***

Title **Caries preventive effect of fissure sealant: a systematic review. *Acta Odontol Scand* 2003; 61: 321–330.**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review	1+	13	Age range 5-14. Studies where children were selected on the basis of special general health conditions were excluded Children had to have at least one pair of caries free molars in order to qualify for a split-mouth study	No. children not reported No. teeth = 4,024	2-5 years	UV-cured, autopolymerised sealant, glass ionomer sealant or resin-modified glass ionomer sealant	Studies involving other preventive measures were not specifically excluded from the review.		The pooled estimate of relative risk reduction of resin-based sealants on first permanent molars compared to unsealed was 33% (RR 0.67 95% CI 0.55 -0.83) . The level of evidence was graded as “limited” 4 studies showed a close relationship between sealant retention and caries risk reduction. (Relative risk reduction >80% where sealants retained and < 20% where sealants lost) 2 studies that replaced defective sealants had risk reductions of 69% and 93% The evidence of effectiveness of sealants was incomplete for permanent 2nd molars, premolars and primary molars, and for glass ionomer cements.

Author conclusions: There remains a need for well designed randomised, controlled trials, particularly in child populations with low and high caries risk, which take into account the benefit, cost effectiveness and long term effects of sealants.

Author **Muller-Bolla M, Courson F, Droz D *et al.***

Title ***Retention of resin-based pit and fissure sealants: a systematic review. Community Dent Oral Epidemiol* 2006; 34: 321-36**

<table>
<tr><th>Study Type</th><th>Evidence Level</th><th>No. of included studies</th><th>Patient characteristics</th><th>No. of patients included in meta analysis</th><th>Duration of included studies</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr><td rowspan="3">Systematic review</td><td rowspan="3">1+</td><td rowspan="3">31 studies

16 studies compared one resin-based sealant with another.

15 studies focused on sealant application technique</td><td rowspan="3">Minimum age 5 yrs</td><td rowspan="3">Not reported</td><td rowspan="3">At least 6 months</td><td>Visible Light cured resin sealant (LRBS)</td><td>Autopolymerised resin sealant (ARBS)</td><td>Complete retention of sealant according to duration of follow up.</td><td>
<table>
<tr><th>Time mths</th><th>RR</th><th>(95% CI)</th><th>No. studies (total =7)</th></tr>
<tr><td>6</td><td>0.98</td><td>0.87-1.11</td><td>2</td></tr>
<tr><td>12</td><td>0.95</td><td>0.91-1.00</td><td>6</td></tr>
<tr><td>24</td><td>0.99</td><td>0.93-1.06</td><td>4</td></tr>
<tr><td>36</td><td>0.99</td><td>0.93-1.07</td><td>2</td></tr>
<tr><td>60</td><td>0.99</td><td>0.92-1.07</td><td>1</td></tr>
</table>
(no significant difference in retention between the 2 types of sealant)
</td></tr>
<tr><td>Visible Light cured resin sealant (LRBS)</td><td>Fluoride-containing resin-based sealant (FRBS)</td><td>Complete retention of sealant according to duration of follow up.</td><td>
<table>
<tr><th>Time mths</th><th>RR</th><th>(95% CI)</th><th>No. studies (total=9)</th></tr>
<tr><td>12</td><td>1.01</td><td>0.96-1.06</td><td>5</td></tr>
<tr><td>24</td><td>0.95</td><td>0.79-1.15</td><td>1</td></tr>
<tr><td>48</td><td>0.80</td><td>0.72-0.89*</td><td>2</td></tr>
<tr><td>54</td><td>0.80</td><td>0.68-0.93*</td><td>2</td></tr>
</table>
* significant difference in complete retention, in favour of light cured sealant without F
</td></tr>
<tr><td>Rubber dam (RD)</td><td>Cotton wool roll (CW) isolation

Using autopolymerised and fluoride containing resin-based sealants</td><td>Complete retention of sealant</td><td>No difference in retention for autopolymerised sealant using rubber dam or cotton wool rolls RR=1 (3 studies)

Sealant retention significantly higher for fluoride containing light cured sealants when rubber dam was used RR = 2.03 95% CI 1.5-2.7 – 1 study

There were too few studies to determine the best clinical procedure for sealants.</td></tr>
<tr><td colspan="10">Author conclusions: The authors noted the small number of studies meeting the inclusion criteria, and their low to moderate quality. They also noted that further RCTs of FRBS retention should consider RBS filler It was not possible to determine the best clinical procedure for sealant application because of the insufficient number of studies. They concluded that “It is still necessary to carry out well-designed, randomised clinical trials focused on sealant retention considering different procedures, particularly new enamel preparation techniques such as air-abrasion or sono-abrasion.”</td></tr>
</table>

Author **Truman B, Gooch B, Sulemana I et al.**

Title **Reviews of Evidence on Interventions to Prevent Dental Caries, Oral and Pharyngeal Cancers and Sports-related Craniofacial Injuries.** ***Am J Prev Med 2002;23(1S) 21-54***

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review of studies of different design	2+	10 in total 1 before/after 4 non-randomised trials 1 retrospective cohort 3 RCTs 1 time series 4 USA studies 6 non-USA studies	Children aged 6-17	Meta-analysis not conducted. However, a median percent change in occlusal caries is reported	2-5 years	Exposure to RBS FS applied as part of school-based* or school-linked ^sealant programme *FS programme conducted in the school ^ FS programme conducted in schools, private dental practices and clinic settings outside of schools.	No exposure to FS as part of a school-based or school-linked programme	Median percent change in occlusal caries	All studies: Median (range) 60% (5% - 93%) USA studies vs non-USA studies 60% (23% -78%) vs 60% (5% -93%) School-based vs School-linked 65% (23% - 93%) vs 37% (5% - 93%) Reapplication vs no reapplication 65% (23% - 93%) vs 30% (5% - 93%)

Author conclusions: According to the Community Guide rules of evidence, strong evidence shows that school-based and school-linked sealant delivery programs are effective in reducing decay in pits and fissures of children's teeth.

Reviewer conclusions: The range of effect of the included studies indicates heterogeneity between the included studies. However, the lowest median caries median reduction was 30%, which is a substantial effect.

Systematic reviews

Sealants and caries progression

Author **Griffin SO, Oong E, Kohn W, et al.**

Title **The effectiveness of sealants in managing caries lesions. *J Dent Res* 2008;87(2):169-174**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review	1++	6 Rated as 'fair' quality.	There were no restrictions on study populations to be included in the meta-analysis. Study populations included children, adolescents and young adults ranging in age from 6 to 19 years.	384 patients, 840 teeth and 1090 surfaces	Varied from 12 - 60 months	Sealants applied to cavitated or non cavitated lesions	No sealants applied	% of lesions progressing Progression defined as demineralisation or loss of tooth structure or placement of a restoration.	**Median annualized progression rates:** Sealed lesions: 5% Unsealed lesions: 16.1% **Prevented fractions for individual studies** ranged from 61.6% to 100% (median 74.2%) **Summary prevented fraction:** Assuming perfect correlation among teeth: 73.2% (95%CI 59.8-82.2%) Assuming no correlation among teeth: 75% (95%CI 67.1-81.1%) Assuming 30% correlation among teeth: 74.1 (95%CI 63.8-81.4%) **Relative risk ratio for the individual studies:** ranged from 20.8%-53.2%

Author conclusions: The evidence supports the placement of sealants over non-cavitated caries lesions in the pits and fissures of permanent teeth in children adolescents and young adults

Reviewer comments: The USPSTF grades the quality of the evidence on a 3 point scale (Good, Fair, Poor) The 6 studies (4 RCTs and 2 cohort studies) included in this review were rated Fair quality: Evidence is sufficient to determine effects on health outcomes, but the strength of the evidence is limited by the number, quality, or consistency of the individual studies, generalizability to routine practice, or indirect nature of the evidence on health outcomes. Although the quality of the trials included in this review was not high, the results were consistent across the 6 studies.

Author **Oong EM, Griffin SO, Kohn WG, Gooch BF, Caulfield PW.**

Title **The effect of dental sealants on bacteria levels in caries lesions. A review of the evidence. *J Am Dent Assoc* 2008;139(3): 271-278**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review	1+	6 studies 3RCTs 2CCTs 1 before-and –after study	There were no restrictions regarding study populations. Age ranged from 6 to 25 years. Fluoridation status not reported for 3 studies, exposure to F water in 2 trials & no fluoridation in 1 trial. Criteria for including teeth in the trials: 1 RCT- Enamel (explorer catch) or dentinal (explorer stick/penetration) 1 RCT- dentinal lesion aperture 1-3mm 1 RCT- dentinal, from DEJ to pulp 2CCTs-Dentinal, no more than half the distance between DEJ and pulp Before-after-Dentinal, visible lesion	Not reported	Ranged from 1 to 60 months	Resin-based sealant/GIC applied to teeth with enamel or dentinal caries lesions. 3 studies used UV polymerised RBS, 2 used autopolymerised RBS and 1 used GIC+Visible light polymerised RBS	Unsealed carious teeth 5 studies; bacterial samples from unsealed teeth obtained at baseline while samples from sealed teeth obtained at follow-up 1 study; all bacterial samples obtained at follow-up (unsealed teeth diagnosed as carious at follow-up, sealed teeth diagnosed at baseline)	Mean viable bacteria count (VBC) measured using CFU/mg % of samples with VBC greater than zero to measure activity for total bacteria, SM and LB	Total bacteria: There were no findings of significant increases in total bacteria under sealants. Reduction in log $_{10}$ mean VBC at the last period in each study was approx threefold in 3 studies and twofold in 2 studies. Overall median and mean reductions 3.01 and 2.56 and increased with time since sealant placement. Reduction in proportion of samples with viable bacteria attributable to sealants ranged from 0-100% (median 50%, mean 51.6%) Excluding results for deep dentinal lesions : median 87.5% mean 71.8% Effect of sealants in reducing levels of S M utans and Lactobacilli was strong in two of the three studies that reported this outcome.

Author conclusions: Sealants reduced bacteria in carious lesions, but in some studies low levels of bacteria persisted. These findings do not support reported concerns about poorer outcomes associated with inadvertently sealing caries.

Reviewer comments: Although data were abstracted from the original studies to assess study quality and are presented in table 1, no overall scores for study quality are presented, and the effect of study quality on the results are not considered. As many of the studies included in the review appear to have been of questionable quality (no examiner blinding, no reporting of drop outs) this may have been an important omission.

Author **Bader J and Shugars D**

Title **The evidence supporting alternative management strategies for Early Occlusal Caries and Suspected Occlusal Dentinal Caries.** ***J Evid Base Dent Pract*** **2006;6:91-100**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Review	2+	N=7 studies for sealing Early occlusal caries: N=7 studies for sealing suspicious areas: Design of included studies not specified.	Not reported for enamel caries. Age 6-15 for suspicious areas or dentine caries	No meta analysis	1-5 years for sealant studiess	Sealant applied over early enamel caries or suspicious areas Other interventions considered were: No treatment Fluorides Antimicrobials Operative treatment (suspicious areas only)	Unclear if there were untreated comparison groups/teeth or if the included studies were prospective cohort studies measuring lesion progression over time	Lesion progression/regression	**Enamel caries and sealant**:(7 studies) Lesion progression of sealed enamel lesions or "failure" (i.e. lost sealant & caries requiring restoration) ranged from 0% after 2 years to 11% after 5 years. **Suspicious lesions and sealant:** 5 of the 7 studies reported rate of lesion progression, which ranged from 0% to 19%, with 2 studies only reporting a "decease". The rate of caries regression, when reported, ranged from 25%-89% for sealed teeth. The rate of caries progression tended to be higher , and regression lower when sealant was defective. **Enamel caries and no treatment:(**6 studies) Progression ranged from 5% to 64%. The evidence did not imply immediate, inevitable progression, at least in permanent teeth **Suspicious lesions and no treatment** : No conclusions could be drawn about caries progression for untreated suspicious lesions due to the small number of studies and the wide variation in reported rates of lesion progression between older and more recent studies (16% - 77%). **Enamel caries and fluoride:** (4 studies) 3 out of the 4 studies found in favour of fluoride, but in only 1 study was the difference statistically significant. There was no evidence for fluorides and suspicious lesions, or for anti-microbials for either enamel or suspicious lesions. Ozone was not effective for suspicious lesions.

Author conclusions: The available evidence suggests that sealing both enamel caries and suspected occlusal dentinal caries is the most effective management approach if subsequent maintenance of the sealed surfaces can be assured.
Reviewer comments: The review lacks information on the methods used to identify and appraise the included studies. The authors stress the weakness of the available evidence and highlight the need for further research and for clinicians to apply the evidence in light of the specific information that a patient presents.

Risk of caries following sealant loss

Author **Griffin SO, Kolavic Gray S, Malvitz DM, Gooch BF.**

Title **Caries risk in formerly sealed teeth. *J Am Dent Assoc* 2009;140;415-423**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review	1+	7 No quality score but selected aspects of study quality are described	Aged 5-14 years 3 studies reported children exposed to community-based water fluoridation/fluoride mouthrinse programmes Caries incidence among never sealed teeth after 1 year ranged from 24-47%	1973 children 4847 teeth	1.5-4 years	Formerly sealed teeth (with partially or fully lost sealant)	Never sealed teeth	The risk of a formerly sealed tooth developing caries was compared to the risk of a never sealed tooth developing caries at each annual follow-up using relative risk % FS developing caries/%NS developing caries	**One year after placement:** RR range: 0.828-1.118 Weighted mean RR 0.998 (95%CI 0.817-1.220) **Two years after placement:** RR range: 0.467-1.186 Weighted mean RR 0.912 (95%CI 0.793-1.048) **Three years after placement:** RR range: 0.761-1.111 Weighted mean RR 0.901 (95%CI 0.789-1.029) **Four years after placement:** RR range: 0.693-1.083 Weighted mean RR 0.936 (95%CI 0.896-0.978) The findings indicate that teeth with partial or complete loss of sealant are not at higher risk of developing caries than they would be if they had never been sealed.

Author conclusions: "The values for both the weighted mean and the median RR suggest that FS teeth with fully or partially lost sealant were not at a higher risk of developing caries than were NS teeth. Thus, the inability to provide a retention examination to all children participating in school-based sealant programs because of potential loss to follow-up should not exclude any child from having access to the well-documented caries-preventive benefit of a retained sealant."

Four-handed versus two-handed application technique

Author **Griffin SO, Jones K, Kolavic Gray S et al.**

Title **Exploring four-handed delivery and retention of resin-based sealants. *J Am Dent Assoc* 2008; 139:281-289**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Indirect comparison of effect of two-handed v four-handed dentistry using studies included in systematic reviews.	3	11 8 four-handed 3 two-handed Most studies began between 1973 and 1995	Between 5 and 10 years old. 7 studies conducted in high income countries (4 conducted in 'not high income' countries) No studies directly compared sealant outcomes with two-handed v four-handed sealant application	8 four-handed studies represented 1189 children and 1944 teeth. 3 two-handed studies represented 885 children and 1000 teeth. Multivariate analysis of the association between sealant retention and four-handed delivery was conducted	1-3 years	Sealant application using four-handed dentistry Auto polymerised sealant	Sealant application using two-handed dentistry Auto polymerised sealant	Sealants retention	Four-handed dentistry increased sealant retention by a statistically significant 9 percentage points. Sealant retention decreased with: o years since placement o study conducted in a high income country o prophylaxis performed with a handpiece before sealant placement o dentist as primary operator
Author conclusions: For this group of studies, four-handed delivery of autopolymerised sealants was associated with increased sealant retention. Using four-handed delivery to place resin-based sealants may increase retention.									

Systematic reviews

Resin-based sealant v Glass ionomer sealant

Author **Beiruti, N., Frencken J E, van 't Hof M A & van Palenstein Helderman W H.**

Title **Caries preventive effect of resin-based and glass ionomer sealants over time: a systematic review. *Community Dent Oral Epidemiol* 2006; 34: 403–9.**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review of RCTs	1-	12 All split mouth trials (2 included in Cochrane review)	Not reported	No meta analysis performed	from 1-7 years	Glass ionomer sealant (categorised separately as low and medium viscosity) Or Low viscosity resin-modified GI sealant	Resin-based sealant (RBS) (auto-cured (AC) or light cured (LC)	Attributable risk (percent difference in caries incidence between RBS and GI sealants)	Meta analysis not possible due to heterogeneity between studies. **AC RBS v low viscosity GI**: (4 studies) Significantly more caries for teeth sealed with GI in 2 trials (at 2 and 3 years) Difference NS in remaining 2 trials **LC RBS v low viscosity GI** (4 studies) Significantly more caries in RBS teeth in 2 trials (at 2 and 3.8 years). Difference NS in other 2 trials. **AC RBS v medium viscosity GI** (2 studies) Significantly more caries in RBS teeth in 1 trial at 3.6 years. Difference NS in other trial **LC RBS v low viscosity RMGIC** (2 studies) Significantly more caries in GI teeth in both trials at 2 and 3 years.

Author conclusions: There is no evidence that either resin-based or glass ionomer sealant material is superior in preventing caries development in pits and fissures over time.

Reviewer comments: The authors of this review make the point that the effectiveness of sealant should be based on caries prevention rather than retention. This review included 2 of the 3 studies that met the inclusion criteria for the original Cochrane FS review (2004). Of the remaining 10 trials, 9 had been excluded from the Cochrane review because pair-wise data was not presented. Statistical methods were used to calculate pair-wise comparisons for the included studies in this review. The conclusion of the authors, based on this analysis, is consistent with the results of the review. The lower level of evidence given to this review is based on the fact that the authors did not conduct a quality assessment of the included studies.

Author **Yengopal V, Mickenautsch S, Bezerra A, Leal S**

Title **Caries preventive effect of glass ionomer and resin-based fissure sealants on permanent teeth: a meta analysis. *Journal of Oral Science* 2009; 51: 373–82.**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review	1-	8 trials 7 split mouth 1 parallel group 4 included in Cochrane review	Age 6-16 1st permanent molar sealed except for 1 trial where 2nd permanent molar sealed. F water exposure in 2 trials ranging from 0.1-0.7ppm	6 trials included in the meta analysis	1-3.6 yrs	GIC sealant	Resin-based sealant	Odds ratio for Caries	4 trials found in favour of RBS* 3 trials found both GI and RBS were effective 1 trial found in favour of GIC * 1 study repaired RBS but not GIC sealants Meta analysis of 6 split mouth trials Pooled OR: 0.96 (95% CI 0.62 – 1.49) suggests neither material is more effective at preventing caries. Heterogeneity (I^2) 87.6%

Author conclusions: This systematic review with meta analysis found no evidence that either material was superior to the other in the prevention of dental caries. Thus, both materials appear equally suitable for clinical application as a fissure sealant material.

Reviewer comments: The high value for I^2 (87.6%) indicates a high level of heterogeneity between the trials, which calls into question the validity of pooling the results in a meta analysis. The conclusion that both materials are equally suitable for clinical application is therefore misleading.

Author **Yengopal V & Mickenautsch S**

Title **Resin-modified glass ionomer cements versus resin-based materials as fissure sealants: a meta analysis of clinical trials. *Euro Arch Paediatr Dent* 2010; 11:18–25.**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review	1+	6	Age 5-27 FPMs (3 trials), FPMs & SPMs (1 trial) Premolars (one trial). No further data provided	4 trials 719 teeth	12-36 mths	Resin-modified glass ionomer sealant	Resin-based sealant or flowable resin	Caries	12 months (4 trials) Pooled RR= 1.00 95% CI 0.96-1.04, p=0.99 NS 24 months (2 trials) Pooled RR = 1.01 95% CI 0.84-1.21, p=0.91

Author conclusions: This meta analysis found no conclusive evidence that either material was superior to the other in preventing dental caries. Therefore both materials appear to be equally suitable for clinical application as FS for a period of up to 2 years. However, the poor quality of the included trials warrants that further high quality RCTs are needed to obtain conclusive evidence of equivalence or difference in caries prevention.

Reviewer comment: Of the 6 included trials, all scored “Unclear” for randomisation and the authors state that the “quality assessment of these trials warrants that the data be treated with caution, owing to the increased risk of bias” which is at odds with the decisive conclusion that “both materials appear to be equally suitable for clinical application as FS for a period of up to 2 years”.

Primary studies

Resin-based sealant v Glass ionomer sealant; Trials since the reviews

Author **Oba AA, Dulgergil T, Sonmez IS, Dogan S.**

Title **Comparison of caries prevention with glass ionomer and composite resin fissure sealants.** ***J Formos Med Assoc*** **2009; 108:11: 844-848**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Field trial Split mouth Random allocation of sealant to teeth indicated but not described.	1-	N=70 children 207 teeth Drop outs Children(n=29) 41% Teeth (n=70) 34% (teeth)	Age 7-11 Attending boarding school in Turkey Caries free or enamel caries lesions on pits and fissures of FPMs	3 years	High viscosity GIC sealant (Ketac Molar) applied using ART technique (in school, no suction, no water, hand pump for drying teeth, no chairside assistance) 4 dentists	LC Resin-based sealant (Fissurit F) applied under same conditions	Retention Caries	GIC N=56 teeth / RBS N=81 teeth Total retention: 11 (19.6%) / 0 Total loss: 31 (55.3%) / 76 (93.8%) Caries: 6 (10.7%) / 8 (9.8%) Difference in retention statistically significant, p<0.01 (one way analysis of variance) Difference in caries incidence not statistically significant, p>0.05

Author conclusions: Under field conditions where moisture control might not be effective, a high-viscosity and less technique sensitive GIC can be used as a feasible and effective sealant, which is equivalent to its resin counterparts.

Reviewer comments: The conditions for sealant placement were so poor in this study that they did not favour either sealant, but particularly not RBS, almost all of which was lost. To state that GIC was equivalent to RBS in this situation, is misleading since almost all the RBS sealants were lost. There was no difference in caries levels between the 2 groups. The lack of information on randomisation, index used for recording caries, number of dentists involved in outcome measurement calibration ,inter/intra examiner reliability and the high dropout mean that this study has a high risk of bias.

Author **Amin, HE.**

Title **Clinical and antibacterial effectiveness of 3 different sealant materials.** ***J Dent Hygiene*** **2008. 82; 5: 1-10**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
CCT Parallel group Random allocation of subjects to test groups indicated but not described	1+	N=45 children N=90 teeth Drop outs N=6 children (13%) N=12 teeth (13.5%)	Age 7-11 Attending Paedodontic clinic in University in Egypt Must have 2 caries free lower FPMs at least 2/3rds erupted, with deep narrow fissures and grooves	2 years	Group 2: Resin modified GIC (Fuji II LC) Group 3: flowable composite (Tetric Flow) All materials applied after prophy with dry bristle brush, under RD in clinic Groups I and 3 applied using 37% phosphoric acid gel. Etch time: 30 sec Group 2 applied using conditioner	Group 1: RBS (Helioseal F)	Retention Caries	RBS n=26 / RMGIC n=24 / Flowable composite n=28 Complete retention: 21 (81%) / 6 (25%)* / 24 (86%) Caries: 1 (4%) / 1 (4%) / 1 (4%) *Complete retention significantly poorer in RMGIC group p<0.05

Author conclusions: This study indicated lower retention of RMGI compared to flowable composite and a resin sealant without significant difference in caries prevention or long-term bacterial inhibition (results for MS levels not reported in this evidence table).

Reviewer comments:

Author **Barja-Fidalgo F, Maroun S, de Oliveira BH.**

Title **Effectiveness of a glass ionomer cement used as a pit and fissure sealant in recently erupted permanent first molars. *J Dent Child* 2009; 76;1: 34-40**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
RCT Parallel group Random allocation using list of random numbers Examiner blind to group assignment of child	1+	N=36 children N=92 teeth Age 6-8 years (mean 6.8) Drop outs N=16 children (45%) N=49 teeth (47%)	Low SES Brazilian children Age 6-8 years (mean 6.8) At least 1 FPM , sound or with non-cavitated enamel lesions, and ≥2dmft Baseline dmfs 16.5 in GIC group and 13.3 in RBS group (clinical and radiographic) F Toothpaste use widespread	5 years	High viscosity GIC (Fuji IX) Applied by graduate students without chairside assistance Surface conditioned with diluted GIC liquid for 15 sec, washed 15 sec, dried with cotton pellets GIC applied with an instrument and pressed into the pits and fissures using finger pressure	Auto polymerised RBS (Delton) CWR isolation 37% phosphoric acid, 30 sec	Complete retention At 5 years	GIC n=21 teeth / RBS n=28 teeth Complete retention*: 6 (29%) / 6 (21%) Caries^: 2 (10%) / 7 (25%) *p value not reported ^Difference not significant: p=0.27 Overall, the DMFS of the GIC group was higher than the RBS group (2.2 v1.6), reflecting the baseline difference that existed.

Author conclusions: High viscosity glass ionomer cement can provide some level of protection against dental caries when used as a dental sealant in situations where it is not possible to adequately isolate the tooth from saliva contamination during sealant application i.e. incompletely erupted or uncooperative children, and where complete GIC sealant retention may not be necessary for its caries preventive effect.

Reviewer comments: Small sample size and high drop out rate limit the conclusions that can be drawn from this otherwise well-conducted trial. Baseline characteristics of the drop outs indicate that they had higher baseline dmfs, were from families with lower mean monthly incomes and were less likely to perform supervised toothbrushing.

Resin-based sealant v F-containing RBS

Author **Lygidakis N and Oulis K.**

Title **A comparison of Fluorshield with Delton Fissure sealant: four year results. *Pediatr Dent* 1998. 21;429-431**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Random allocation of teeth on one side of mouth to test & other to control material	1+	N=112 children 448 FPMs 4 FPMs sealed/child Drop outs: N=31 children (28%)	Age 7-8 years Baseline dft= 1.94 Topical F gel provided to all children as part of a preventive programme	4 years	Fluoroshield - a light-cured filled, F-releasing sealant Mechanical preparation CWR Acid Etch: 60 sec	Delton (LC,unfilled)	Sealant retention Caries	Fluoroshield N=161 / Delton N=162 Complete retention*: 124 (77%) / 144 (89%) P=0.01 No difference in caries 9% v 10% in Fluoroshield & Delton groups respectively

Author conclusions: In a regular biannual preventing programme including topical fluoride gel application , F-releasing filled sealant (Fluoroshield) appears to have a declined full retention rate when compared with a non-F non-filled sealant (Delton). However, total sealant loss and caries increment was similar in both groups.

Reviewer comments:

Author **Kargul B, Tanboga I, Gulman N.**

Title **A comparative study of fissure sealants Helioseal Clear Chroma and Delton FS+: 3 year results.** ***Eur Arch Paediatr Dent*** **2009; 10: 218-222**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Random allocation side of mouth to each sealant	1+	N=31 children N=121 teeth N=8 children (26%) N=29 teeth (24%)	Age 6-9 years 4 erupted, caries free, FPMs without hypoplasia All had good OH. Regular Topical F applied throughout study	3 years	Helioseal Chroma (transparent sealant that temporarily changes colour when exposed to curing light, to make it easier to monitor retention) CWR Applied using standard acid etch technique	Delton FS+, an opaque sealant with fluoride	Retention Caries Yes/No	Complete retention Mths (teeth) — Delton FS+ — Helio Chroma 12 n=121 — 50% — 31% 24 N=107 — 46% — 19% 36 N=92 — 30% — 11% P<0.0001 for each time comparison % Caries free teeth 12 — 98% — 89% 24 — 98% — 87% 36 — 91% — 80% Difference at 36mths not statistically significant

Author conclusions: Delton FS+ showed a better complete retention rate for occlusal FS at one year. Both FS were aesthetically acceptable and easy to see during application and follow up periods and gave significant protection from occlusal decay.

Reviewer comments: Retention rates for both materials were low, even at 1 year. Criteria for recording caries are not provided (merely present or not present).

Methods of cleaning the tooth

Toothbrush v handpiece

Author **Kolavic Gray S, Griffin SO, Malvitz DM, Gooch BF.**

Title **A comparision of the effects of toothbrushing and handpiece prophylaxis on retention of sealants. *J Am Dent Assoc* 2009. 140: 38-46**

Study Type	Evidence Level	No. of included studies	Patient characteristics	No. of patients included in meta analysis	Duration of included studies	Intervention	Comparison	Outcome measure	Results
Systematic review and Indirect comparison of data from studies included in systematic reviews of effect of FS Also, summary of manufacturers' instructions for use of 10 different unfilled sealants	3	2 studies included for direct evidence 11 studies from 4 systematic reviews met inclusion criteria for indirect comparison	Age 5-10	Not reported	12-60 mths	Tooth surface preparation using a toothbrush, with or without toothpaste (2 studies)	Tooth surface preparation using Handpiece prophylaxis with pumice or paste (10 studies)	Complete retention at each year of follow-up	Complete retention in year 1 was significantly better for TB compared to handpiece. (94% v 87%, based on 2 TB studies and 5 HP studies) No significant difference in retention between the 2 methods was found for years 2-5.

Author conclusions: Levels of sealant retention after surface cleaning with toothbrush prophylaxis were at least as high as those associated with handpiece prophylaxis.

Reviewer comments: The one study that directly compared dry toothbrushing with handpiece prophylaxis (Gillcrist 1998) found no difference at 1 year between the 2 methods. The indirect comparison involved grouping selected studies by method of surface cleaning and comparing retention rates in bivariate analysis, without controlling for other factors that might have influenced sealant retention, such as age of participants, (which ranged from 5-8 in one study to 8-10 in another) state of eruption of teeth or method of isolation. The authors refer to another review (Griffin et al, 2009) which analysed the same group of studies using multivariate analysis (to investigate the effect of 4-handed v 2-handed sealant application) and found that toothbrush prophylaxis was associated with higher sealant retention than handpiece prophy.

Toothbrush v handpiece

Author **Gillcrist JA, Vaughan MP, Plumlee GN, Wade G.**

Title **Clinical Sealant retention following two different tooth-cleaning techniques. *J Public Health Dent* 1998. 58 (3) 254-6**

<table>
<tr><th>Study Type</th><th>Evidence Level</th><th>No. of participants</th><th>Patient characteristics</th><th>Study Duration</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr>
<td>Split mouth

Quasi randomised

Alternation between R & L side for cleaning method

Blind outcome assesment</td>
<td>1+</td>
<td>N=74 children
N=296 teeth

Drop out: 11 children
(44 teeth)</td>
<td>USA
Age 6-8 years

4 fully erupted, sound FPMs
Co-operative</td>
<td>1 year</td>
<td>Handpiece prophy for 15 second on upper and lower molars on one side of the mouth.

Fluoridated prophy paste used.

CWR isolation

A/E: 37% OPA, 20 sec

LCRBS (Helioseal)</td>
<td>Toothbrushing of U & L molars without toothpaste on opposite side of mouth

Same procedure for FS application</td>
<td>Sealant retention</td>
<td>Complete retention

<table>
<tr><th></th><th>Handpiece
N=126</th><th>TB
N=126</th><th>Both
N=252</th></tr>
<tr><td>12 mth</td><td>98%</td><td>99%</td><td>98.4%</td></tr>
</table>
</td>
</tr>
<tr>
<td colspan="9">Author conclusions:. Dry brushing by the operator may be an acceptable alternative to using a rotary instrument with brush and paste

Reviewer comments: Limitations of the study are the short follow up and the relatively small sample size. The authors make the point that almost one third of school-based sealant programmes use a toothbrush to clean the teeth before sealant application, sometimes by the children themselves. therefore the acceptability of this technique is important.</td>
</tr>
</table>

Air and water

Author **Donnan FM, Ball IA.**

Title **A double-blind clinical trial to determine the importance of pumice prophylaxis on fissure sealant retention. *Br Dent J* 1988. 165; 8: 283-6**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results		
Split mouth Random ised	1+	N=59 children 350 sites Drop out: 8 children (13.5%)	UK Age 7-16 Attending community dental clinic	12 mths	Fissures cleaned of debris with a sharp probe, used without force, and then washed with forceful atomised water spray from 3 in 1 syringe Isolation: CWR or dry guards A/E: 37% PA, 60 sec LCRBS - Helioseal	Handpiece Prophylaxis with pumice Same technique for sealant application	Sealant retention		Handpiece 149 sites	Probe & water 149 sites
								Complete retention	144 (96.6%)	145 (97.3%)

Author conclusions:.The results of this clinical study show no statistically significant differences between the 2 treatment groups. Therefore, from a clinical standpoint, it can be concluded that prophylaxis of teeth with pumice prior to etching contributes little towards sealant retention, and this step can be legitimately omitted. The elimination of this preparatory pre-etch stage makes the procedure less involved and less time consuming for the operator and more acceptable for the young patient.

Reviewer comments: The authors make the point that “in situations where teeth are so heavily coated with plaque that examination of the tooth surface is impossible, cleaning would be required in the first instance to enable valid clinical inspection.” This implies that the non-pumiced teeth sealed in this study must have been quite clean at the outset. The study did not evaluate patient acceptance of the procedure with and without pumicing, therefore the conclusion that not pumicing is more acceptable for the young patient is not based on the results.

Air abrasion

Author **Yazici AR, Kiremitci A, Celik C *et al.***

Title **A two-year clinical evaluation of pit and fissure sealants placed with and without air abrasion pretreatment in teenagers. *J Am Dent Assoc* 2006. 137;1401-1405**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Random assignment of teeth to etch. Blind outcome assessment	1+	N=16 N=162 teeth (116 premolars (72%) 46 molars) Drop outs: 0	Age 16-17 Patients at Dental School in Ankara, Turkey No restoration or sealant on fissures	2 years	Pumice prophy Air abrasion followed by A/E 35% PA, 30 sec LCRBS (Concise) Rubber dam isolation	No air abrasion Otherwise, same procedure as test group	Sealant retention	Air abrasion + etch N=81 Etch only N=81 12* 95% 84% 24^ 91% 76.5% * p=0.025 ^ p= 0.002

Author conclusions:.As air abrasion followed by acid etching resulted in significantly higher sealant retention rates, this method could be a good choice for fissure preparation before sealant placement for longterm success.

Reviewer comments: Most of the teeth sealed were premolars, which show higher retention rates than molars. The distribution of premolars/molars between the 2 groups is not described. The small sample size limits the generalisability of the results of this study. Data not analysed as paired data. The ADA evidence statement that “there is limited and inconclusive evidence in favour of using air abrasion as a cleaning method before acid etching to improve sealant retention” is justified. It might be more accurate to say there is limited evidence that air abrasion prior to acid etching increases sealant retention after 2 years, when used mostly on premolar teeth.

Author **Kanellis MJ, Warren JJ, Levy SM.**

Title **A comparison of sealant placement techniques and 12-month retention rates.** ***J Public Health Dent*** **2000. 60(1): 53-56**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Parallel group Randomised Blind outcome assessment	1+	N=74 children N=539 surfaces Drop outs: N=58 (31%)	Grade 1-4 (? Age 7-10?) ≥1 FPM sufficiently erupted & sound	1 year	Children dry-brushed their teeth 15 sec air abrasion CWR & DryAid isolation LCRBS Helioseal	Children dry brushed teeth 37% PA, 30 sec Cotton wool roll & DryAid isolation Helioseal	Retention by tooth surface (occlusal, buccal, palatal) and for all surfaces	All surfaces 12 month Complete retention *surfaces Complete retention: Air abrasion N=169: 12mth 57%; Acid Etch N= 215: 81% p<0.01 Complete retention was significantly worse for buccal and palatal surfaces with air abrasion (65% v 6.5% for buccals and 58% v 28% for palatals(p<0.01) No significant difference in retention was found for occlusal surfaces (97.5% v 89% for etch and air abrasion respectively p=0.17 Air abrasion was approximately 30% quicker than acid etching

Author conclusions:. Although more research is needed to improve air-abrasion application s, it does not appear that air abrasion without acid etching offers a significant advantage over traditional sealant placement methods, and in fact appears to be inferior to the acid-etching technique for use in public health settings.

Reviewer comment: Drop outs were high in this study – approximately 1/3rd of children after only 1 year. The authors also make the point that in a public health setting , the air abrasion equipment adds to costs, even though the treatment time is lower.

Mechanical preparation

Author **Shapira J and Eidelman E**

Title **The influence of mechanical preparation of enamel prior to etching on the retention of sealants: three year follow up. *J Pedodontics* 1984;8: 272-77**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Randomised		N=47 children 61 pairs of molars Drop outs: 13 children (21%)	Age 6-9 Attending clinic in Jerusalem dental school At least 1 pair of homologous caries free, fully erupted FPMs, Non-fluoridated	3 years	Mechanical preparation of fissure using a no. 1 round steel bur Pumice, A/E 60 sec ACRBS (Delton) Isolation not described	No mechanical preparation Same sealant application procedure	Sealant retention	Complete retention: Mechanical preparation / Acid Etch All teeth N=96: 45 (94%) / 39 (81%) Maxillary teeth (n=22): 19 (86%) / 14 (64%) P=0.062 Of the 48 tooth pairs analysed at the end, 38 pairs showed complete retention in both test and control teeth, 7 pairs had partial or complete loss in the control teeth and 1 pair had partial loss in the test tooth. All but 1 of the failures occurred in maxillary teeth. The difference in sealant retention in maxillary molars was borderline non-significant (p= 0.062)

Author conclusions:.It can be concluded that mechanical preparation results in higher retention rates of sealants for maxillary first molars.

Reviewer comments: The authors used auto-cured sealant, and state that on maxillary molars, the sealant tends to flow off the tooth surface distally, leaving a thin layer of sealant, which may not polymerise correctly. They suggest mechanical preparation on maxillary teeth allows a thicker layer of sealant. The applicability of mechanical preparation to modern light-cured sealants is unclear.

Author **Shapira J and Eidelman E**

Title **Six year clinical evaluation of fissure sealants placed after mechanical preparation: a matched pair study. *Pediatr Dent* 1986;8: 204-5**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Randomised	1+	N=47 children 61 pairs of molars Drop outs: 27 tooth pairs (44%)	Age 6-9 Attending clinic in Jerusalem dental school At least 1 pair of homologous caries free, fully erupted FPMs, Non-fluoridated	6 years	Mechanical preparation of fissure using a no. 1 round steel bur Pumice, A/E 60 sec ACRBS (Delton) Isolation not described	No mechanical preparation Same sealant application procedure	Sealant retention	Complete retention: Mechanical preparation / Acid Etch All teeth N=68: 30 (88%) / 32 (65%)* Maxillary teeth (n=30): 13 (87%) / 7 (47%)^ Mandibular teeth N=38: 17 (89.5%) / 15 (79%) * p<0.02, ^ p<0.016

Author conclusions:.It was concluded that mechanical preparation resulted in a significantly higher retention rate of sealant placed on maxillary molar teeth.

Reviewer comments: The high losses to follow up limit the conclusions that can be drawn from the results. The authors used auto-cured sealant, and state that on maxillary molars, the sealant tends to flow off the tooth surface distally, leaving a thin layer of sealant, which may not polymerise correctly. They suggest mechanical preparation on maxillary teeth allows a thicker layer of sealant. The applicability of mechanical preparation to modern light-cured sealants is unclear.

Self-etch v acid etch

Author **Feigal RJ & Qualhas I**

Title **Clinical trial of self-etching adhesive for sealant application: Success at 24 months with Prompt L-Pop. *Am J Dent* 2003; 16: 249-51**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
SM randomised	1+	36 teeth (18 tooth pairs) No. children or tooth pairs at baseline not reported Drop outs: 0?	Age 7-13 Mean age = 10.5 Attending Paediatric dental clinic Low to moderate caries risk Mixed fluoride region 28/36 sealed teeth were FPMs	24 mths	Prompt L-Pop self-etch 1-bottle adhesive 15 sec application LCRBS: Delton CWR isolation	A-E 30sec PA Delton CWR	Retention	Self-etch / Acid Etch Complete retention: 11/18 (61%) / 11/18 (61%) **Mc Nemar's Chi Square Paired analysis: p>0.8** Clinical time for application significantly different: 3.1 min for Acid Etch and 1.8 min for self-etch

Author conclusions:. We conclude that Prompt L-Pop self-etching primer/adhesive will effectively bond sealant to enamel and will simplify the procedure in patients for whom the standard etching methods pose a compliance problem.

Reviewer comments: The conclusions are based on the results. The authors do not report the number of children or tooth pairs at baseline, but simply present the 24 month results. The reader must assume that there had been no drop outs.

Author **Venker DJ, Kuthy RA, Qian F *et al.***

Title **Twelve-month sealant retention in a school-based program using a self-etching primer/adhesive. *J Public Health Dent* 2004 64;4:191-197**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Retrospective Chart analysis of cohort	3	272 children Drop out: 64 children (23.5%)	Age 9 (range 7.4 – 10.3) 45 (22%) sealed with self-etch technique 163 (78%) sealed using acid etch technique Participating in school-based sealant programme in Des Moines, Iowa	12 mths	Prompt L-Pop self-etch 1-bottle adhesive 15 sec application LCRBS: Delton Opaque DryAngle & CWR isolation	Acid etch (PA) 15-20 sec LCRBS: Delton Opaque DryAngle & CWR isolation	Retention (measured at surface, tooth and subject levell)	Self-etch / Acid Etch Tooth surface: 58% (124/212) / 75% (584/774) Tooth: 51% (74/145) / 72% (391/545) At the subject level, children who were sealed with Acid etch technique were 6 times more likely to have complete retention compared to Prompt L-pop teeth OR 5.97 (95% CI 2.39-14.86) p<0.0001

Author conclusions:. Though sealants were retained in larger numbers with phosphoric acid, overall sealant retention at the tooth level was lower than previously published for clinical studies and school-based programmes. Examining retention data at the person level however, allows programme administrators to plan resources more effectively and re-evaluate sealant protocol to ensure as few children return for sealant reapplication.

Reviewer comments: SBS programme. 1 school used Prompt L-Pop, 4 used acid etch. 2 hygienists. Complete or partial loss was considered a failure. Retention at the person level was considered a failure if any surface had failed. Outcome assessment was not blind, since the examiner was aware of the school in which the self-etch technique. This, coupled with the stringent criteria for failure at the subject level, could lead to an overestimate of the difference in effect between the 2 methods

Author **Lampa E, Brechter A, van Dijken JWV.**

Title **Effect of a non-rinse conditioner on the durability of a polyacid-modified resin composite fissure sealant.** ***J Dent Child*** **2004; 71:152-7**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
SM Randomised	1+	N=31 children 98 teeth Drop out: 2 children (9%)	8 (6-13) Attending public dental clinic in Kiruna, Sweden	24 mths	No rinse conditioner+ Prime & Bond No-rinse conditioner: 20 sec application Self-etch primer:20 sec Dyract Seal (compomer) CWR & dry tip isolation	1. A-E: 36% PA 60 sec LCRBS: Delton DDS opaque 2. A-E + Prime & Bond + Dyract Seal CWR & dry tip isolation	Sealant retention Marginal adaptation Caries	Complete retention — No rinse conditioner /Dyract Seal — Acid Etch/Delton 6 mth — 70% — 78% 12 mth — 41%* — 67% 24 mth — 16%* — 66% *sealant retention significantly lower in self-etch Dyract seal group at 12 & 24 mths p<0.001 No Caries 12 mth — 100% — 94% 24 mth — 98% — 91% P not reported Due to poor retention in of the Dyract seal with conditioner at 6 months, a separate comparison group was created,(n=25 children, age 6-16) where Prime& Bond + Dyract Seal was applied using A-E technique. Complete Retention of Dyract seal placed with A-E was better than Dyract seal with conditioner at 12 months (89% v 41%, <0.01). Retention was also better than Delton (89% v 67%, p<0.05)

Author conclusions: Conditioning with No rinse conditioner prior to sealant application cannot be recommended.

Reviewer comments: The conclusion is consistent with the results. However, it would have been more informative if the study had included a no-rinse conditioner Delton control group.

Self-etch v acid etch with bonding

Author **Burbridge L, Nugent Z, Deery C.**

Title **A randomised controlled trial of the effectiveness of a one-step conditioning agent in fissure sealant placement: 12 month results. *Eur Ach Paediatr Dent* 2007;8:49-54**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
SM Randomised	1+	60 children 81 pairs of molars (mostly mandibular) Dropouts: 24 children (37%)	Mean age 9.15 Range:5-13 Regularly attending Dental hospital & community clinics in Lothian area of Scotland Molars sufficiently erupted for isolation and children co operative	12 months	XenoIII self-etch 2-bottle Adhesive 20 sec application Delton opaque CWR isolation	A-E: 37% PA 20 sec Prime and Bond 20 sec Delton opaque CWR isolation	Sealant replacement Sealant coverage Caries	Xeno III + Delton N=50 teeth: Replacement 31 (62%)* A-E, Prime&Bond + Delton N=50 teeth: Replacement 12 (24%) P<0.001 No significant difference was seen in caries levels between the 2 groups at 12 months. (actual values not reported)

Author conclusions:.The best practice for placement of sealants remains enamel preparation with acid etch and use of an intermediate bonding layer.

Reviewer comments: Sealants were applied by 7 operators - 3 dentists, 3 hygienists and 1 therapist. The study does not control for operator variation.

Author **Yazici AR, Karaman E, Baseren M *et al*.**

Title **Clinical evaluation of a nanofilled fissure sealant placed with different adhesive systems: 24-month results**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
SM Randomised	1+	N=16 adults 244 sealants Drop out: 1 adult 16 teeth (6.5%)	Mean age=20 (range 18-21) Attending University dental Faculty, Ankara, Turkey	24 mths	One step Self-etch adhesive (FuturaBond NR) Nano-filled Fissure sealant (Grandio Seal) CWR isolation	Etch and rinse adhesive (Solo Bond M) 34.5% PA 30 sec Nano-filled Fissure sealant (Grandio Seal) CWR isolation	Sealant retention	Complete retention / Self-etch adhesive system: FuturaBond NR / Acid etch adhesive system: Solo Bond M 12 mths n=122: 25 (20.5%) / 109 (89.3%) 24 mths n=114: 18 (15.8%) / 93 (81.6%) Difference between groups significant at both time points, P<0.001 No caries was recorded

Author conclusions:.Fissure sealants placed with etch and rinse adhesive showed better retention rates than those placed with self-etch adhesive.

Reviewer comments: Subjects in this study had an average of 15 sealants placed and the analysis does not take account of clustering. There were 4 operators, and there is no measure off operator variability. .

Acid etch + adhesive system v acid etch without adhesive

Author **Feigal RJ, Musherure B, Gillespie M *et al***

Title **Improved sealant retention with bonding agents: A clinical study of two-bottle and single-bottle systems. J Dent Res 2000. 79;11: 1850-56**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
SM Randomised	1+	N=165 children 617 teeth FPMs & SPMs Loss = 17% at 24 mths & 38% at 48 & 60mth		60 mths	A-E: PA 30 sec + 2 bottle bond system (Tenure) + Fluoroshield A-E + 2 bottle bond system (Scotchbond) + Fluoroshield A-E + one bottle system: (3 diff brands): Prime& Bond Single Bond Tenure Quik + Fluoroshield CWR	A-E: PA 30 sec Fluoroshield CWR isolation	Sealant survival (measured according to score obtained for marginal integrity, marginal discolouration, anatomic form as well as presence of dental caries.)	Sealant survival over time was **significantly better** on occlusal (p=0.014) and buccal/palatal surfaces (p=0.006) **using the one bottle system** compared to the control. The risk of sealant failure on occlusal surfaces in the one-bottle group was approximately half that of the control group. (Hazard ratio (HR) 0.53, p=0.014) There was no difference in sealant survival with Tenure compared to control, and Scotchbond was detrimental to sealant survival on occlusal surfaces Other factors significantly associated with sealant failure on occlusal surfaces were: Non ideal Patient behaviour: HR=1.96, p=0.0007 Non ideal Saliva control: HR=1.73, p=0.002 Arch (lower v upper): HR=0.77, p=0.038 Incomplete state of eruption*: HR=2.9,p<0.0001 Alteration in enamel: HR=1.51, p=0.018 Provider HR=0.31,p=0.037 (provider 1 reduced risk of failure) *operculum or gingival level with distal marginal ridge v completely erupted)

Author conclusions:.Findings indicate a beneficial effect of single-bottle adhesive systems. When used between enamel and sealant, these agents yield half the usual risk of failure for occlusal sealants and one third the risk for buccal/lingual sealants. In addition, significant negative effects on sealant survival were observed with early eruption, enamel alterations, less than ideal patient behaviour and less than ideal saliva control.

Reviewer comments:

Author **Boksman L, Mc Connell RJ, Carson B, Mc Cutcheon-Jones EF.**

Title **A 2-year clinical evaluation of two pit and fissure sealants placed with and without the use of a bonding agent. *Quintessence Int* 1993. 24;131-133**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
SM Not randomised Teeth on L side received bond	1-	No. participants not reported No. teeth=402 Drop out: 103 (26%) at 12 mths 181 (45%) at 24 mths	Healthy Adolescents (no. not reported) Fluoridated Attending private practice At least 2 pit and fissure sites on opposite sides of the mouth Teeth sufficiently erupted to allow RD isolation		A-E 37% PA 60 sec Scotchbond 2 LCRBS: Concise RD isolation A-E 37% PA 60 sec Universal Bond LCRBS: Prisma Shield RD isolation	A-E 37% PA 60 sec LCRBS: Concise RD isolation A-E 37% PA 60 sec LCRBS: Prisma Shield RD isolation	Complete retention	Complete retention: With bonding agent / Without bonding agent 12 mths n=249: 122 (41%) / 127 (43%) 24 mths n=174: 82 (37%) / 92 (42%) Sealant placed without bonding agent had higher retention rates, but the difference was not significant

Author conclusions:. The results of this study indicated that the use of a bonding agent prior to the application of a pit and fissure sealant does not increase the retention rate.

Reviewer comments: Although this is a split mouth trial, allocation of the teeth to receive bonding agent was not randomised, just the choice of bonding agent and sealant. Blind outcome assessment is not indicated and is unlikely

Author **Mascarenhas AK, Nazar H, Al-Mutawaa S, Soparkar .**

Title **Effectiveness of primer and bond in sealant retention and caries prevention. *Pediatr Dent* 2008; 30;25-8**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Randomised	1+	N=78 children 86% female 312 FPMs (4 per child) No losses reported " all children with sealed teeth were recalled)	78 children Mean age:7.7 (6-9) 4 sound FPMs Participating in School Oral Health programme in Kuwait	24 mths	A-E: 15 sec Scotchbond Multipurpose Plus system primer and bond LCRBS: Delton Plus RD isolation	A-E: 15 sec LCRBS: Delton Plus RD isolation	Sealant retention Caries	With primer and bond / Without primer and bond Complete retention at 24 mths: 64% / 68%* Caries at 24 mths: 24% / 26%^ *Difference between 2 groups not significant (p=0.22) ^ p=0.56 Paired analysis: OR for complete retention: 1.29 95% CI 0.8-2.1 **NS** Multivariate analysis No difference in sealant retention with or without bond, after controlling for age, gender, tooth surface and arch.

Author conclusions: When a proper technique is used in sealant placement, use of a primer and bond did not enhance sealant retention

Reviewer comments: The authors suggest that the Scotchbond Multipurpose Plus system might not have been compatible with the Delton sealant, and this may have led to no difference being seen. Single examiner, no intra-examiner reliability, no criteria reported for recording of caries.

Author **Pinar A, Sepet E, Gamze Aren *et al***

Title **Clinical performance of sealants with and without a bonding agent. Quintessence Int 2005. 36: 355-360**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
SM Randomised	1+	N=30 children 120 FPM surfaces	Age 8-10 Attending Paediatric dentistry clinic, in Instanbul, Turkey All 4 FPMs sound and unsealed at baseline	24 mths	A-E: PA 30 sec One Coat Bond LCRBS: Fissurit F CWR isolation	A-E: PA 30 sec LCRBS: Fissurit F	Anatomic form (corresponds to extent of tooth surface covered with sealant) Marginal integrity Marginal discolouration	With bonding agent / Without bonding agent Complete retention at 12 mths (As defined by authors: Score 0,1 & 2a) 40/48 (83%) / 39/48 (81%) Complete retention (Score 0,1 & 2a) at 24 mths 35/44 (79.5%) / 33/44 (75%) Difference at each time point not significant

Author conclusions: The success of a sealant is related to whether the sealant is applied under optimal conditions. The results of this study show that at the 2-year mark, the placement of a bonding agent under sealants did not significantly affect the clinical success of sealants.

Reviewer comments: 2 examiners in this study. No indication of examiner calibration or of inter and intra-examiner reliability

Author **Lykidakis N, Dimou G, Stamakaki E.**

Title **Retention of fissure sealants using two different methods of application in teeth with hypomineralised molars (MIH): a 4 year clinical study** ***Eur Arch Paediatr Dent*** **2009. 10:4; 223-226**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Random assignment of FPMs to test and control	1+	N=54 children Drop outs: n=7 (18.5%)	Age 6-7 yrs Regular attenders at the Community Dental Centre, Athens At least 2 contralateral, fully erupted, caries-free FPMs with mild defects without breakdown Baseline mean dft = 1.04	48 months	Enamel prep with round bur ¼ slow handpiece Bristle brush with non-F paste Acid etch: 37% PA etch 30sec Adhesive (One-step) applied twice and polymerised FS (brand name not given) Cotton wool isolation 1 operator	FS only Same procedure without adhesive	Retention Caries	Complete retention: With bonding agent / Without bonding agent Year 1: 100% / 79% Year 2: 100% / 47% Year 3: 89% / 28% Year 4: 70% / 26% Significantly better retention in bond group at 4 years ($p<0.001$) No significant difference for caries (3 teeth in test v 5 teeth in control, $p>0.01$)

Author conclusions:. In hypomineralised molars with occlusal opacities, sealants appear to have greater retention when applied using 5th generation adhesive systems prior to sealant.

Reviewer comments: Criteria for MIH were non-disintegrated occlusal demarcated opacities (mild defect), and therefore results can only be generalised to similarly affected teeth. The adhesive used is similar to the single bottle bonding agent recommended in the ADA guideline

Isolation

Author **Straffon LH, Dennison JB, More FG.**

Title **Three-year evaluation of sealant: effect of isolation on efficacy. *J Am Dent Assoc* 1985. 110; 714-717**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Quasi-randomised (alternation)	2+	N=29 children 50 pairs of teeth Drop outs: 24 surfaces lost to follow-up	Selected from a paedodontic clinic Age range: 5-14 (5-9 for FPMs, 11-14 for SPMs) 2 contra-lateral partially erupted or newly erupted FPMs or SPMs with deep grooves with no significant explorer catch indicating caries	36 mths	Fissure sealant (not described) applied under rubber dam using topical anaesthetic Pumice prophylaxis Etch 60 sec Dried 30 sec Applied by trained practitioner with the aid of trained auxiliary personnel Defective sealants were retreated at each 6mthly recall visit in both the intervention and comparison groups	Cotton wool roll isolation using various CWR holders, “Theta dri-angles” and evacuation Same sealant application procedure and retreatment	Sealant retention Sealant retreatment Caries	<table><tr><th></th><th>CWR</th><th>RD</th></tr><tr><td>Complete retention at 36 mths (without retreatment)</td><td>65.2%</td><td>62.2%</td></tr><tr><td>Complete retention at 36 mths (with retreatment)</td><td>100%</td><td>96.6%</td></tr><tr><td>Average Retreatment rate over 36 mths</td><td>5.0%</td><td>5.4%</td></tr></table> Difference in retention with or without retreatment, and average retreatment rate was not significant Of the 76 surfaces evaluated at 36 months, 24 (31.6%) had been retreated, and 80% of these teeth required only one retreatment. The highest retreatment rate was at baseline (2 weeks after application) and at 6mths None of the teeth in either group developed caries

Author conclusions:. The average retention rate over the 36 months was 94.7%, with cotton roll isolation at 95% and rubber dam at 94.3%. No caries occurred in any sealed surface when sealants were periodically evaluated using specific criteria and new sealant was applied to defective area of the existing sealant. The retreatment rate was highest at baseline (8%) and at 6 months (11.3%). Of the total number o sealants retreated, (n=31), 61% (n=19) were from the mandibular arch. At 36 months, 31% (n=24) of the treated teeth required treatment. Of the 24 teeth retreated, 19 (80%) required only one retreatment.

Reviewer comments: Although this was conducted as a split mouth trial, the data were not paired for analysis. In fact, it is unclear what statistical method, if any, was used to analyse the data. Although the authors state “There was no significant difference in retention for the two isolation methods used” there is no reference to statistical analysis, so it is possible that the authors may mean clinical significance

Author **Ganss C, Klimek J, Gleim A**

Title **One-year clinical evaluation of the retention and quality of 2 fluoride releasing sealants. *Clin Oral Invest* 1999. 3:188-193**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Randomised	1+	N=58 203 teeth Drop outs: 4 subjects (7%) and 10 teeth (5%) lost to follow-up	Mean age: 13.7 ± 3.6 126 (65%) of the teeth sealed were premolars Patients of private practice 39% female	12 mths	Helioseal F (LC) applied under RD or with CWR Pumice prophylaxis Stained fissures enlarged with carbide bur 37% PA 40 sec Dried 20 sec Applied by same clinician in private practice	Fissurit F (LC) applied under RD or with CWR Same application procedure	Sealant retention assessed clinically and photographically Sealant surface quality Sealant margin (visual/tactile and staining with dye application) Caries	See table below ^Retention of Helioseal F was better than Fissurit F overall ($p<0.05$). A significant difference in retention between the 2 materials was seen when cotton wool isolation was used ($p<0.05$) but not when rubber dam was used Complete sealant retention rates were significantly higher for both materials with rubber dam isolation compared to cotton wool isolation $p<0.001$ 4 patients (10 teeth) developed caries – in all cases, sealant all had been applied with CWR isolation

Complete retention at 12	CWR	RD	Total
Helioseal F	42.3%	68.3%	53.4%^
Fissurit F	26.1%	69.5%	44.6%^

Author conclusions: The findings suggest that placement under rubber dam increases retention rate and sealant quality and may reduce material-dependent factors that are considered a cause of sealant failures.

Reviewer comments: The conclusions are consistent with the results.

Author **Eidelman E, Fuks A, Chosack A.**

Title **The retention of fissure sealants: rubber dam or cotton rolls in private practice *ASDC J Dent Child* 1983. 50 (4); 259-61**

<table>
<tr><th>Study Type</th><th>Evidence Level</th><th>No. of participants</th><th>Patient characteristics</th><th>Study Duration</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr>
<td>Prospective
Observational
cohort</td>
<td>3</td>
<td>N=95
233 teeth</td>
<td>Age range:6-14
65% were aged 6-8</td>
<td></td>
<td>92 teeth were sealed using RD isolation
RD was used in quadrants where restorative work was required</td>
<td>141 teeth sealed with CW isolation</td>
<td></td>
<td>
<table>
<tr><th>Complete retention</th><th>CWR</th><th>RD</th><th>Total</th></tr>
<tr><td>12 months</td><td>121/131 (92.4%)</td><td>47/80 (92.5%)</td><td></td></tr>
<tr><td>24 months</td><td>53/60 (88.3%)</td><td>26/27 (96.3%)</td><td></td></tr>
</table>
Statistical analysis using a comparison of two observed frequencies with a normal approximation showed no significant differences between the failure rate in the two treatment modalities.
</td>
</tr>
<tr>
<td colspan="9">Author conclusions: This study demonstrated that retention rates of Delton fissure sealant were not significantly affected by the method of isolation

Reviewer comments: Blind outcome stated but not possible, as RD was used when restorative work in the quadrant was required. The lack of randomisation of the method of isolation means that the results can only be interpreted as an observational study.</td>
</tr>
</table>

Effectiveness in primary teeth

Author **Chadwick B, Treasure E, Playle, R.**

Title **A randomised controlled trial to determine the effectiveness of glass ionomer sealants in pre-school children. *Caries Research* 2005;39:34-40.**

<table>
<tr><th>Study Type</th><th>Evidence Level</th><th>No. of participants</th><th>Patient characteristics</th><th>Study Duration</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr>
<td>Parallel group RCT</td>
<td>1+</td>
<td>N=508 children

Test= 241
Control = 267

Loss to follow-up:
Test = 8%
Control= 15%</td>
<td>South Wales

Mean age: 2 yrs
Age range: 1.0 – 2.7 yrs

High caries area</td>
<td>3.4 yr (average)

Variable follow-up (mean 1.38 yrs in test & 1.30 yrs in control. Range: 0.95-3.54 yrs</td>
<td>Single application of GIC to first primary molars
No suction, CWR isolation
Child on parent’s lap
DHE, Toothbrush &Toothpaste provided
65% of all appointments were made to child’s home</td>
<td>No GIC sealant
DHE, Toothbrush &Toothpaste</td>
<td>Sealant retention
% of children with caries in occlusal surface of primary molar

Oral Hygiene</td>
<td>
<table>
<tr><th></th><th>Test (n=221)</th><th>Control (n=228)</th></tr>
<tr><td>No. (%) of children with sealants present</td><td>69 (31.2%)</td><td>3 (1.3%)</td></tr>
<tr><td>No. (%) with caries on occlusal surface of 1st primary molar</td><td>17 (7.7%)</td><td>24 (10.5)*</td></tr>
<tr><td>No. (%) with dmft>0</td><td>52 (23.5%)</td><td>55 (24.1%)</td></tr>
</table>
Difference: 2.8 (95% CI -2.6 to 8.3%) NS
</td>
</tr>
<tr>
<td colspan="9">Author conclusions: There is no evidence that the intervention as used in this population had any effect on caries incidence and it cannot be recommended as a clinical procedure.
Reviewer comments: The authors note that recruitment to the study was difficult, and as a result, much of the treatment seems to have been conducted in the home, in less than optimal conditions, which would not favour sealant retention. The conclusions drawn by the authors are valid.</td>
</tr>
</table>

Author **Poulsen, P**

Title **Retention of glass ionomer sealant in primary teeth in young children. *Eur J Paediatr Dent* 2003;4:96-8.**

<table>
<tr><th>Study Type</th><th>Evidence Level</th><th>No. of participants</th><th>Patient characteristics</th><th>Study Duration</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr>
<td>Split mouth

Random allocation of side of mouth to sealant using table of random numbers

Blinding not possible</td>
<td>1+</td>
<td>N=65</td>
<td>Denmark
Mean age=53.2 mths
(4 yr 5 mth)
Range: 3.25 – 8.5 yrs

Low caries population
Background use of fluoride TP</td>
<td>Variable

Mean=23.5 mths
Range: 7 - 35 mths</td>
<td>GIC sealant (Fuji II) LC used without conditioner</td>
<td>No sealant on contra lateral teeth</td>
<td>(Scores for Fully and partly retained sealant were combined)
Sealant survival time by tooth type</td>
<td>
<table>
<tr><th></th><th>12 mths</th><th>24 mths</th></tr>
<tr><td>Sealant retention* rate in 2nd primary molars</td><td>~75%</td><td>~40%</td></tr>
<tr><td>Sealant retention *rate in 1st primary molars</td><td>< 50%</td><td>~30%</td></tr>
</table>
*Full or partial retention
Mean survival time for sealants placed on second primary molars was slightly less than 2 years, and approximately 1 year for 1st primary molars
</td>
</tr>
<tr><td colspan="9">Author conclusions: Retention rates for glass ionomer fissure sealants were satisfactory. However, high quality randomised clinical trials to estimate caries preventive effect are still needed.
Reviewer comments: The combination of complete and partial retention for calculating sealant retention and survival would overestimate complete retention rates, compared to other studies where only fully retained sealants would be counted.</td></tr>
</table>

Author **Corona SAM , Borsatto MC, Garcia L et al.**

Title **Randomized, controlled trial comparing the retention of a flowable restorative system with a conventional resin sealant: one-year follow up. *Int J Paed Dent* 2005; 15:44-50**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Split mouth Random assignment of molars	1+	N=40 children 80 primary molars(40 pairs) 80 permanent molars Drop out = 0	Brazilian Age range: 4-7	1 year	Flowable resin composite (Flow-it) Total etch Single bottle adhesive system (Bond 1)	RBS (Fluorshield)	Complete retention	Complete retention Flowable resin / RBS Primary n= 80 teeth: 95% / 77% p<0.01 Permanent n=80 teeth: 100% / 95% NS

Author conclusions: The flowable restorative system yielded optimal retention on both primary and permanent molars. Overall retention rate was higher than that of the conventional pit and fissure sealant on primary teeth.

Reviewer comments: No indication given of the characteristics of the participants or of distribution of age (mostly younger or older?) Analysis not done as paired data. Trial stopped after 1 year because of high dropout, so 1-year result may be an overestimate of the effect, since retention declines with time.

Author **Hardison J, Collier D, Sprouse L et al.**

Title **Retention of pit and fissure sealant on the primary molars of 3- and 4-year-old children after 1 year. *J Am Dent Assoc* 1987;114(5):613-5.**

Study Type	Evidence Level	No. of participants	Patient characteristics	Study Duration	Intervention	Comparison	Outcome measure	Results
Prospective cohort observational study	3	Not reported 1,871 children originally received sealant A random sample of these was followed up 781 surfaces were examined	Tennessee Age= 3-4 years at placement Low income, high caries risk (Medicaid)	1 year follow up	Sealant placed 1 year previously as part of a sealant programme "Visibly detectable" sealant was used	No sealant	Sealant retention (Sealed, partly sealed & missing)	Sealed: 88.2% Differences in sealant retention rates were recorded between different regions (range 74% - 96.3%)

Author conclusions: Sealant applied by experienced operators to primary teeth may be expected to be retained for periods comparable to retention times for permanent teeth

Reviewer comments:

Author **Hotuman E, Rolling I, Poulsen P.**

Title **Fissure sealants in a group of 3-4 year old children. *Int J Paediatr Dent* 1998;8(2):159-60.**

<table>
<tr><th>Study Type</th><th>Evidence Level</th><th>No. of participants</th><th>Patient characteristics</th><th>Study Duration</th><th>Intervention</th><th>Comparison</th><th>Outcome measure</th><th>Results</th></tr>
<tr>
<td>Split mouth

Teeth in each tooth pair randomly assigned to test or control sealant</td>
<td>1+</td>
<td>N=52 children

Drop out not reported.

52 pairs of primary molars evaluated at follow up.but no. of pairs of primary molars originally sealed is not reported</td>
<td>Denmark
Median age: 3.7 yrs
Age range: 2 yrs 11 mths to 4 yrs 11 mths
Attending municipal dental clinics</td>
<td>Mean 2.2 years
Range: 2.0–3.3yrs</td>
<td>Delton (AC)</td>
<td>Prisma Shield LC</td>
<td>Complete retention

Caries</td>
<td>
<table>
<tr><td></td><td>Delton AC</td><td>Prisma Shield</td></tr>
<tr><td>Complete retention</td><td>3(5.9%)</td><td>5(9.8%)</td></tr>
<tr><td colspan="3">Difference NS: p=0.49</td></tr>
<tr><td>Caries</td><td>70.6%</td><td>76.5%</td></tr>
<tr><td colspan="3">Difference NS</td></tr>
</table>
</td>
</tr>
<tr><td colspan="9">Author conclusions: The retention rates obtained in this present study are comparable to those obtained in many studies on permanent teeth after a 2 year observation period, and indicates that sealing of primary molars in young preschool children may be an effective method of preventing caries in this age group. However further studies are needed to estimate the caries-preventive effect of this procedure.

Reviewer comments: Same dentist who applied the sealants measured the outcome, which may have introduced examiner bias.</td></tr>
</table>