Caries-preventive effect of fissure sealants: a systematic review

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The objectives of this study were to evaluate systematically the evidence of the caries-preventive effect of fissure sealing of occlusal tooth surfaces and to examine factors potentially modifying the effect. The search strategies included electronic databases, reference lists of articles, and selected textbooks. Inclusion criteria were randomized or quasi-randomized clinical trials or controlled clinical trials comparing fissure sealing with no treatment or another preventive treatment in children up to 14 years of age at the start; the outcome measure was caries increment; the diagnostic criteria had been described; and the follow-up time was at least 2 years. Inclusion decisions were taken and grading of the studies was done independently by two of the authors. The main measure of effect was relative risk reduction. Thirteen studies using resin-based or glass ionomer sealant materials were included in the final analysis. The results showed that most studies were performed during the 1970s and a single application had been utilized. The relative caries risk reduction pooled estimate of resin-based sealants on permanent 1st molars was 33% (relative risk = 0.67; CI = 0.55–0.83). The effect depended on retention of the sealant. In conclusion, the review suggests limited evidence that fissure sealing of 1st permanent molars with resin-based materials has a caries-preventive effect. The evidence is incomplete for permanent 2nd molars, premolars and primary molars and for glass ionomer cements. Overall, there remains a need for further trials of high quality, particularly in child populations with a low and a high caries risk, respectively. □ *Pit and fissure sealants; systematic review*

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Fissure sealants have been widely used for more than three decades in preventing caries, mainly in pits and fissures of occlusal surfaces of premolars and molars. The method was introduced in the late 1960s and involves the application of a thin layer of resin directly on the fissures after pretreatment with acid. The method is technique-sensitive in that saliva contamination after the acid-etch treatment destroys the tags created by the acid and thereby the mechanical retention of the resin. The first generation of resin-based sealants (no longer available) cured through ultraviolet (UV) light. The second generation cured automatically through chemical reactions, while the third generation cures from visible light. The fourth generation has fluoride incorporated in the resin.

In the middle of the 1970s, glass ionomer cement (GIC) was introduced as an alternative to the resin-based sealants (1). Retention to the tooth surface is based on the adhesive properties of the cement, and the application of GIC is not as sensitive to moisture as the resin-based sealants. Another advantage with GIC is its release of fluoride. The cement is relatively brittle, however, and a considerable disadvantage with GIC as a fissure sealant is its insufficient retention (2). In more recent years, resin-modified GICs have been introduced onto the market.

Numerous clinical trials on the caries-preventive effect of fissure sealing, mostly in permanent teeth and from the 1970s, have been reported. These studies have also been the subject of several narrative reviews, i.e. (3–18) and a meta-analysis (19). To our knowledge, no systematic quantitative evaluation of the available evidence of the caries-preventive effect of fissure sealing has yet been published.

The objectives were to systematically determine the effectiveness of fissure sealants in preventing caries of occlusal surfaces of premolars and molars in the child/adolescent population and to examine factors potentially modifying the effect. The present review is one in a series of systematic reviews of methods for caries prevention performed by the Swedish Council on Technology Assessment in Health Care (SBU), (20).

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Material and methods

Search strategies for identification of studies

Relevant studies were identified by searching the Medline and Cochrane Library databases (from 1966 to November 2001 with a later update in August 2003). The search was made with an information specialist at SBU. The primary search strategy included the MeSH terms 'dental caries' and 'pit and fissure sealants'. The term 'dental caries' was also combined with the words 'sealant', 'sealants', and 'sealing'. A total of 1250 records were identified. Filters were then used to allow the inclusion of only clinical trials, comparative studies, evaluation studies, cohort studies, and retrospective studies. This search resulted in 390 records.

Identification of relevant reports

All records electronically identified from the search strategy listed above (390 records) were printed off and all abstracts (or the article in full if an abstract was unclear or missing) were assessed independently by 2 reviewers (2 of the authors). Besides Swedish, Danish, Norwegian, and English, articles in German, French, Italian, and Spanish were considered. Letters, editorials and short communications were excluded. Obviously irrelevant reports (according to study design/duration, participants or interventions) were also discarded. An article was read in full if at least one of the reviewers considered the study to be potentially relevant according to the basic criteria for inclusion that had been set up in advance: randomized (RCT) or quasi-randomized (split mouth) studies or controlled clinical trials (CCT), the outcome measure was caries increment (Δ DFT/Δ DFS or Δ dft/Δ dfs) and the follow-up time at least 2 years. All eligible studies retrieved from the searches, review articles in English or German published in 1980 or later, and one meta-analysis were scanned for relevant references. Reference lists of relevant chapters from preventive dentistry textbooks were consulted and personal contacts were also used for retrieving relevant articles. Another 13 articles were retrieved from the hand search. The grey literature was not included.

A total of 113 studies were considered potentially eligible from this search strategy. The two reviewers further examined these studies in detail independently using a previously prepared and pilot-tested data extraction form. The form included information about title, authors, journal, year of publication, place of investigation, type of sealant, application technique, study design (RCT, quasi-randomized clinical trial or CCT), randomization procedures, method of sampling, sample size, sample characteristics such as baseline caries prevalence and background exposure to fluoride sources, inclusion and exclusion criteria, type of tooth/surface studied, diagnostic criteria and reliability, independent outcome assessment, attrition, follow-up time, measure(s) of effect, statistical analyses, and sources of possible bias or confounders.

Table 1. Final inclusion criteria

- Outcome measure is caries increment (Δ DFT/Δ DFS or Δ dft/Δ dfs)
- Randomized (grouping by children) or quasi-randomized (split mouth) clinical trials or controlled clinical trials (including grouping by school class)
- Teeth/groups of teeth under investigation specified
- Diagnostic criteria defined
- Children or adolescents aged ≤14 at the start of the study (≤8 years for 1st permanent molars and ≤14 years for 2nd molars)
- Follow-up time at least 2 years

Attempts were made to contact authors in order to obtain missing information or clarification when necessary. The final inclusion criteria are given in Table 1.

When multiple reports of the same material had been published, only the report with the longest follow-up time was included. Studies comparing a resin-based sealant material with a GIC sealant or xylitol chewing gum were excluded, as were studies where participants were selected on the basis of special general health conditions. Using these criteria, 13 studies involving 3897 children/adolescents were included in the final analysis. All potentially eligible studies that were excluded, and the main reasons for their exclusion, are given in Table 2.

Criteria for grading and evaluation

The two reviewers graded the 13 included studies independently according to the criteria given in Table 3. Any disagreement regarding inclusion/exclusion or grading was discussed and where necessary the study was discussed in common with all the authors in order to achieve consensus. The conclusions drawn from this systematic review were based on a protocol proposed by the SBU (21). The criteria for four levels of evidence are given in Table 4.

Measures of treatment effect

The measures of treatment effect were *relative risk reduction* (the number of decayed occlusal surfaces in the controls minus the number of decayed surfaces in sealed teeth divided by the number of decayed surfaces in the controls) or *prevented fraction* (caries increment in the controls minus caries increment in the sealed group divided by caries increment in the controls). Since these measures are independent of the caries incidence in the population being studied, it was considered appropriate also to calculate the *net gain* when possible. This measure takes into account the caries incidence in the population being studied and therefore provides a better estimate of the magnitude of the likely benefit of the intervention. Net gain (the number of decayed surfaces in the controls minus the number of decayed surfaces in sealed teeth divided by the number of sealed surfaces ×100) was described in or could be calculated from 10 of the 13 studies.

Table 2. Excluded studies and the main reasons for exclusion. A study can appear under more than one heading

Reason for exclusion	Reference
Adults	(35, 36)
Attrition rate cannot be calculated	(37, 38[1]) (39, 40)
Caries-free subjects excluded	(41)
Comparative study	(42–48)
Compares high-risk and low-risk children	(49)
Compares resin-based and GIC[2] sealants	(2, 50–52) (53–57)
Compares resin-reinforced GIC with conventional GIC	(58)
Compares 2 resin-based materials	(59, 60)
Compares xylitol chewing gum and fissure sealants	(61)
Diagnostic criteria missing	(62–65, 66[3]) (36, 67–70)
Few subjects, major bias	(71, 72)
Follow-up	(63, 73–84) (85–103)
Historic controls	(90, 94, 97, 99, 101, 103, 104)
High attrition rate	(64, 68, 81, 105, 106)
No intervention	(63, 73, 78, 107, 108)
Prevention program	(47, 83, 109–118)
Results reported twice	(119)
Retrospective study	(98, 117, 120)
Teeth not specified	(121)
Less than 24 months' observation	(67, 121–124)
Underway results	(125)[4] (126)[4] (127)[5] (128)[6] (129)[7] (130)[7] (131)[8] (132)[8] (133)[9] (134, 135[10])

[1]Only sticky fissures. [2]Glass ionomer cement. [3]Population not defined. [4] Final data in (23). [5]Final data in (33). [6]Final data in (29). [7]Final data in (28). [8]Final data in (25). [9]Final data in (136). [10]Final data in (32).

The pooled estimate of effect was calculated using the Comprehensive Meta-analysis Program (Biostat, Inc. N.J., USA, version 1.0.23). In order to get as homogeneous a material as possible, only studies using resin-based materials and a single sealant application on 1st permanent molars were included. Eight studies using the tooth pair as the unit of analysis met these criteria. The caries-preventive effect was expressed as *relative risk* (Fig. 1.)

Table 4. Definition of evidence level (21)

- Strong evidence: At least 2 studies with high level of evidence (A) or good systematic review
- Moderate evidence: One study with level (A) and at least 2 studies with moderate level of evidence (B)
- Limited evidence: At least 2 studies with level (B)
- Incomplete evidence: Less than 2 studies with level (B)

Results

A total of 113 studies were assessed in detail. Thirteen of these studies met the inclusion criteria (Table 1) and formed the basis for the evaluation of evidence of the caries-preventive effect of fissure sealants according to the criteria given in Tables 3 and 4. The main characteristics of the 13 studies are presented in Table 5. None of them was graded as A (high value as evidence), 2 were graded as

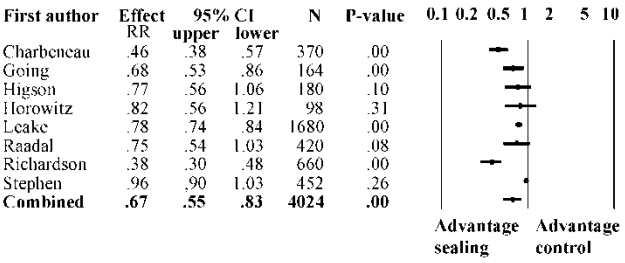

Fig. 1. The pooled estimate caries preventive effect of fissure sealing expressed as relative risk. A meta-analysis including 8 studies using resin-based materials and a single sealant application on occlusal surfaces of permanent 1st molars. RR = relative risk, CI = 95% confidence interval, N = total number of teeth. Random model.

Table 3. Criteria for grading of studies

A (high value as evidence)	B (moderate value as evidence)	C (limited value as evidence)
All criteria stated below should be met	All criteria stated below should be met	One or more of the conditions stated below
Randomization by children	Randomization by children, school class or tooth pair (split mouth)	No or unclear randomization
Diagnostic reliability test made and described	Diagnostic reliability test made and described	Diagnostic reliability test not described
Baseline DFT/DFS (dft/dfs) values described	Baseline DFT/DFS (dft/dfs) values described	Baseline DFT/DFS (dft/dfs) values not described
Independent outcome assessment	Independent outcome assessment	No independent outcome assessment
Statistical analysis (difference between test and control group calculated)	Relative risk reduction or relative risk described	Relative risk reduction or relative risk not described and cannot be calculated from the results
Attrition reported, explained, not exceeding 10%/year	Attrition reported, not explained but not exceeding 10%/year	Attrition not reported or more than 10%/year
A representative sample of the population under study; results can be generalized	The population under study defined; results cannot be generalized	The population under study not defined
Bias and possible confounders have been considered	Bias and possible confounders have been considered	Potentially significant bias/confounders that could distort the results not considered

Table 5. Main characteristics of the 13 studies included

First author, year (ref)	Design[1]	Intervention[2]	No. of subjects/pair of teeth[3] (at start)	Age (year)	Tooth	Application	Follow-up (year)	Independent assessment	Attrition rate (%)	Treatment effect[4] (%)	Value as evidence
Bravo, 1997 (23)	CCT[5]	Delton (CP)	104/365 (T) 128/434 (C)	6–8	1st molar	Repeated	4	Yes	19 Analysed	69	B
Leake, 1976 (22)	CCT (SM)	Nuvaseal (LC)	518/840	5–7	1st molar	Single	4	Yes	19 Not explained	22	B
Charbeneau, 1979 (33)	CCT (SM)	Kerr (CP)	143/229	5–8	1st molar	Single	4	No	19 Not explained	54	C
Going, 1977 (29)	CCT (SM)	Nuvaseal (LC)	84/479	10–14	Molars Premolars	Single	4	Yes	20 Not explained	30	C
Higson, 1976 (31)	CCT (SM)	Nuvaseal (LC)	50/90	6–8	1st molar	Single	2	No	10 Explained	23 (NS)	C
Horowitz, 1977 (28)	CCT (SM)	Nuvaseal (LC)	241/604	5–7 12–13	1st molar 2nd molar Premolars	Single	5	Yes	44 Explained	30–38	C
Pereira, 2003 (25)	CCT (Ch)	Vitremer (RMGIC) Ketac Bond (GIC)	208/832	6–8	1st molar	Single	3	Yes	18 Not explained	56	C
Poulsen, 1979 (32)	RCT (Ch)	Concise (CP)	256/1024	6	1st molar	Single	2	No	27 Explained	12 (NS)	C
Raadal, 1984 (30)	CCT (SM)	Concise (CP)	121/210	6–9	1st molar	Single	2	Yes	Not given	24 (NS)	C
Richardson, 1980 (136)	CCT (SM)	Concise (CP)	266/425	7–8	1st molar	Single	4	No	17 Not explained	62	C
Songpaisan, 1995 (24)	CCT (Ch)	Delton (CP)	133 (T) 143 (C)	12–13	2nd molar	Repeated	2	Yes	11 Explained	93	C
		Fuji III (GIC)	221 (T) 118 (C)	7–8	1st molar	Repeated	2	Yes	14	52–74	C
		Fuji III (GIC)	261 (T) 143 (C)	12–13	2nd molar	Repeated	2	Yes	11	20–31 (NS)	C
Stephen, 1978 (27)	CCT (Ch)	TP2006 (LC)	269 (T) 273 (C)	5–7	1st molar	Single	4	No	< 10 Explained	4 (NS)	C
Thylstrup, 1978 (26)	CCT (SM)	Concise (CP)	217/452	7	1st molar	Single	2	Yes	12 Explained	50	C

[1]CCT = controlled clinical trial, RCT = randomized clinical trial, SM = split mouth, Ch = grouped by children.
[2]CP = chemically polymerized, LC = light cured, GIC = glass ionomer cement, RMGIC = resin-modified glass ionomer cement.
[3]T = test, C = control.
[4]Relative risk reduction (%), NS = no statistically significant difference in caries rate between the test and control groups.
[5]Randomized on school class.

B (moderate value as evidence), and 11 as C (limited value as evidence).

Relative risk reduction

The effect of fissure sealing with resin-based materials on permanent 1st molars had been evaluated in 11 of the 13 studies. Using a single sealant application, the relative risk reduction varied from 4% to 54% and for repeated applications from 69% to 93% (Table 5). The pooled estimate effect of resin-based fissure sealing of 1st permanent molars showed that the relative risk of developing caries in fissure-sealed teeth relative to untreated control teeth was 0.67 (confidence intervals 0.55–0.83), corresponding to a relative risk reduction of 33% (Fig. 1). The assumption that the studies were taken from the same population was rejected, since the test of heterogeneity was highly significant ($P < 0.001$). The results were therefore valued according to a conservative assumption that the studies represented different populations (random effects model). All but one of these studies (22) was graded as being of limited value as evidence (C).

Evidence

Two studies were graded as a moderate level as evidence (22, 23). Both have an observation time of 4 years and investigated the effect on permanent 1st molars. The former used a chemically polymerizing sealant and defective sealants were replaced. The relative risk reduction was 69%. The latter used a light-cured sealant and a single application, resulting in a risk reduction of 22%. Thus, the evidence that fissure sealing of permanent 1st

molars with resin-based materials has a caries-preventive effect was rated as limited (level 3; Table 4).

One study used GIC for sealing permanent 1st and 2nd molars (24). Using repeated applications, the prevented fraction after 2 years of follow-up was significant for 1st molars and amounted to 52–74%, depending on the operator. Another study (25) used GIC or RMGIC and a single sealant application. The relative risk reduction of the two GIC materials compared with unsealed teeth was 56% after 3 years of follow-up. Both studies were considered to have a limited value as evidence (C). There was thus incomplete evidence that fissure sealing with glass ionomer cements has a caries-preventive effect (level 4; Table 4).

Study characteristics

One study was randomly grouped by children and classified as RCT, while the rest were classified as CCT. For some studies, the randomization procedure was unclear. They were all classified as CCT. The study by Bravo et al. (23) was grouped by school-class and 8 studies had used the split mouth design (Table 5). In all but one study, teeth with sticky fissures were considered eligible for sealing. The reliability test at the start and/or the independent assessment at the end of the study were clearly described in half of the studies.

A number of measures of evaluation were used: relative risk reduction (22, 25–29), prevented fraction of the mean DFS increment (24), survival analysis and relative risk (23), and net gain (29, 30). The whole occlusal surface was used as the basis for calculating the effect in 11 studies, while 2 used part of the fissure system for this purpose. A statistical analysis of the difference in caries increment between sealed and non-sealed teeth was made in about half of the studies (23–27, 31, 32) and confidence intervals were described in three (23, 26, 29).

Most studies were published in the 1970s. The follow-up time varied from 2 to 5 years. The majority investigated the effect on permanent 1st molars and used a single sealant application, while regular repeated applications were done in two studies. Five studies used UV-light-cured sealants, 7 chemically polymerized sealants, while one used both chemically polymerized and GIC sealants. One study used a conventional GIC and a RMGIC (resin-modified GIC) (Table 5).

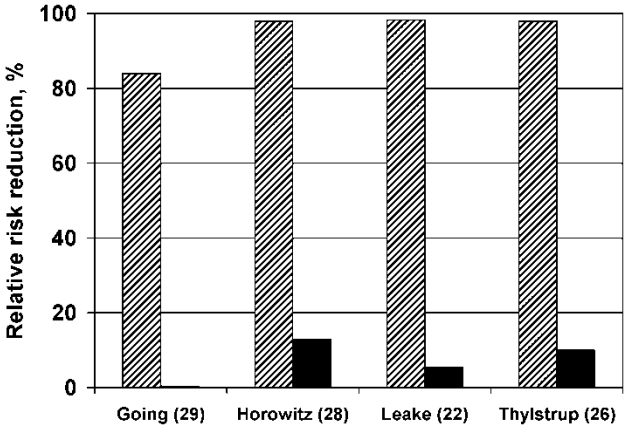

Fig. 2. Relative caries risk reduction related to retention of the sealant. Results from four studies reporting on this matter. ▨ denotes intact sealant, ■ denotes lost sealant.

Influence of retention of the sealant

Four studies described the association between retention of the sealant and the caries-preventive effect. The close relationship between the two factors is illustrated in Fig. 2.

Effect on different tooth surfaces and net gain

The upper 1st permanent molar showed less relative risk reduction compared with the lower molar (Table 6). Three studies investigated the effect on the 2nd permanent molar: one used repeated applications and reported a prevented fraction of 93% (24), while the other two used a single application and found a relative risk reduction of about 30% (28, 29). The materials, however, are small in the two latter studies. All three studies were graded as C (limited value as evidence). There was thus incomplete evidence that fissure sealing of permanent 2nd molars has any caries-preventive effect. The net gain from fissure sealing in the present review varied from zero to 42 (Table 7).

Studies that met the inclusion criteria regarding the caries-preventive effect of visible light-cured or fluoride-containing resin-based sealants could not be identified. The same applied to the use of sealants on premolars and primary molars.

Table 6. Relative caries risk reduction of upper and lower occlusal surfaces of permanent 1st molars. Data from 3 studies using a single sealant application

First author	No. of participants/ no. of tooth pairs	Follow-up time (years)	Relative risk reduction		
			Upper	Lower	Total
Charbeneau (33)	143/229	4	53	55	54
Higson (31)	50/90	2	12	35	23
Horowitz (28)	43/43	5	−7	36	30

Discussion

The inclusion criteria in the present systematic review are much stricter than those used in the meta-analysis by Llodra (19), where 24 studies were included and an overall relative caries risk reduction of 71% was suggested. This is much higher than the finding of a pooled relative risk reduction estimate of 33% in the present meta-analysis. It should be noted, though, that Llodra found a significantly lower relative risk reduction (59%) after 4 years of follow-up. It should also be pointed out that the aggregated data in our meta-analysis derived from studies that—with one exception—were graded as a limited level of evidence (C), and the pooled estimate effect must be interpreted with this in mind.

Most clinical trials on the caries-preventive effect of fissure sealants have used the split mouth design, whereby the caries-preventive effect can be assessed by comparing teeth with sealants with untreated control teeth with the individual as its own control. The split mouth design is useful for assessing the efficacy of fissure sealants. However, for evaluating the effect from a population perspective (effectiveness), the split mouth design has certain disadvantages. Thus, since the inclusion criterion is a child with at least one pair of caries-free molars, a caries-active child will be excluded. In other words, not all children have the same chance to participate. The split mouth design can therefore be regarded as a quasi-randomized study. Furthermore, the longer the time after eruption the greater the risk that the caries-active child will be excluded from the study (26, 27). This type of error can be reduced if the study starts soon after eruption of the teeth to be investigated. Even though the inclusion criteria for this review were restricted to studies starting within 2 years after eruption of the tooth to be investigated, selection bias could not be ruled out. There is thus an obvious risk that caries-active children were excluded when they could not present with at least one pair of caries-free molars. The proportion of excluded children is given in 9 of the 13 studies and in 5 it was at least 20% (22, 24, 27, 28, 33). None of these studies reported the dft (dfs)/DFT (DFS) values of these children, and it is therefore not possible to assess to what extent they differed from those eligible for the study.

There are a number of factors potentially modifying the caries-preventive effect of fissure sealing, such as caries prevalence in the population under study, single or repeated sealant applications, type of sealant material, follow-up time, type of tooth and jaw (upper or lower), the operator and the content of fluoride in the drinking water (19). Owing to the small number of studies and their heterogeneity in study populations and design, no meta-regression analysis stratified by these factors was performed because of its very limited power to detect any true relationship between the preventive effect and the specified factors. The large variety of measures of evaluation and the differing units of analysis also complicate comparisons. However, some possible modifying factors are discussed.

The majority of the studies were from the 1970s, when caries prevalence in general was much higher than it is today in many Western countries. It can therefore be questioned to what extent the populations studied are representative of today's child populations. Two studies investigated the effect of fissure sealing in children with a low caries prevalence (30, 32). Both reported fairly low relative risk reductions of 12% and 24%, respectively, and with no statistically significant difference between sealant and control groups. Unfortunately, both studies suffer from methodological shortcomings and they were therefore graded as of limited value as evidence. It is noteworthy that no RCT or CCT could be identified where children at high risk of caries had been investigated.

It might be argued that studies using outdated and perhaps inferior sealant materials should not be included in a systematic review. However, without them we would have lost important information about the principle effects of fissure sealing and the number of included studies would have been small. Furthermore, because of the limited number of studies and several interacting factors it is not possible to draw inferences from the present review about whether or not the material itself played a decisive role. However, the retention influenced the relative risk reduction, as illustrated in Fig. 2. Replacement of defective sealants therefore seems to be a strong modifying factor, as illustrated also by the relatively high-risk reductions of 69% and 93%, respectively, in the two studies where this strategy had been used (23, 24).

Another modifying factor could be the type of tooth. The materials are small and any interference is therefore uncertain, but the results indicate a less good effect on upper 1st molars compared with lower 1st molars (Table 6).

Little attention has been paid to the long-term effect of fissure sealants, and the longest follow-up time in the present review was 5 years (28). The effect of follow-up

Table 7. The net gain (= number of decayed control teeth minus number of decayed sealed teeth divided by total number of sealed teeth ×100) of a single sealant application. Results from 10 studies

First author	Follow-up time (years)	Type of tooth	Net gain*
Charbeneau (33)	4	1st molars	42
Going (29)	4	2nd molars,	12/43**
		Premolars	23
Higson (31)	2	1st molars	12
Horowitz (28)	5	1st molars	10
		Premolars	9
		2nd molars	14
Leake (22)	4	1st molars	15
Raadal (30)	2	1st molars	7
Richardson (136)	4	1st molars	34
Stephen (27)	4	1st molars	0
Thylstrup (26)	2	1st molars	32
Pereira (25)	3	1st molars	18

* No. of teeth saved per 100 sealed teeth; **upper molars = 12; lower molars = 43.

time on the caries-preventive effect of sealant could not be evaluated in the present review due to too few studies. Llodra (19), however, concluded that the effect decreased as follow-up time increased. Bitewing radiography at the end of the study was not used in any of the studies. The extent to which dentin caries is present under sealed occlusal surfaces, in general, is unknown. It is noteworthy, though, that radiographic evidence of dentin caries was found in 50% of fissure-sealed molars in 17-year-olds (34). More than half of the studies in which net gain could be calculated had a value of less than 20 (Table 7). The level of a reasonable net gain is arbitrary, but it can be questioned whether a net gain under 20 justifies fissure sealing from a cost-benefit point of view.

Implications for research

Despite the large number of clinical trials evaluating the caries-preventive effect of fissure sealants, there is a great need for well-designed randomized trials, particularly in child populations with a low and a high caries risk, respectively. The long-term effects of fissure sealing are also important to evaluate. It is important that future trials include the benefit and cost-effectiveness of fissure sealing.

In conclusion, this review suggests limited evidence that resin-based fissure sealing of 1st permanent molars has a caries-preventive effect. There is incomplete evidence that fissure sealing of primary molars, premolars, and permanent 2nd molars has a caries-preventive effect, or that fissure sealing is beneficial in child/adolescent populations at low-risk for caries, and the same applies to populations at high risk for caries. Furthermore, there is incomplete evidence that fissure sealing with glass ionomer cements has a caries-preventive effect.

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