



HAUTE AUTORITÉ DE SANTÉ

CLINICAL PRACTICE GUIDELINES

**Assessment of caries risk and
indications for pit and fissure sealants
(first and second permanent molars)
in children and in adolescents under 18**

November 2005

Synopsis

Title	Assessment of caries risk and indications for pit and fissure sealants (first and second permanent molars) in children and in adolescents under 18
Publication date	November 2005
Requested by	<i>Caisse nationale de l'assurance maladie des travailleurs salariés (CNAMTS)</i> , the French National Health Insurance fund for salaried workers
Produced by	<i>Haute Autorité de santé (HAS)</i> - Guidelines Department; Health Economics and Public Health Department
Intended for	Dental and oral health professionals managing children and adolescents under 18. Also of interest to general practitioners, school doctors, paediatricians whose practice includes prevention of caries, patients and their parents (except for Section VI).
Objectives	<ul style="list-style-type: none"> - Describe how to assess individual caries risk - Provide indications for pit and fissure sealing (1st and 2nd permanent molars) - Propose a clinical protocol for applying materials and monitoring sealants
Assessment method	<ul style="list-style-type: none"> - Systematic review of the literature - Discussion among members of an <i>ad hoc</i> working group - External validation by peer reviewers
Literature search	Period: 1965 - 2004
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Collaborations and participants (Annex 1)	<ul style="list-style-type: none"> - Learned societies - Steering committee - Working group (Chair: Professor Michèle Muller-Bolla, dental surgeon, Nice) - Peer reviewers
Internal validation	Validated by the Committee for Practice guidelines and Practice Improvement (HAS Board) in November 2005
Related publications	The full report (in French) on which these guidelines are based is on the HAS website (www.has-sante.fr).

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I. Introduction

I.1 Background

The prevalence of dental caries has decreased regularly in children and adolescents since the 1970s. The disease is now concentrated in individuals with a high caries risk. However, if the improvement in oral and dental health in the general population is to continue, these individuals need to be identified and treated.

The incidence of caries is now higher on the occlusal surfaces of molars, probably because these surfaces are less responsive to standard preventive measures, such as:

- brushing – It is difficult to clean pits and fissures, particularly when they are deep, with a toothbrush;
- fluorides – They are less effective in protecting pits and fissures.

Studies mainly on first permanent molars have confirmed that fissure sealants are effective in preventing caries on occlusal surfaces. Since January 2001, fissure sealing for first and second permanent molars in at-risk individuals aged under 14 has been included in the French nomenclature of professional procedures (NGAP). However, no details are given on how caries risk should be assessed.

Fissure sealing has two possible benefits. It can reduce the occurrence of:

- (i) occlusal caries in subjects with a high individual caries risk (ICR). Occlusal surfaces need to be protected from the caries risk to which all teeth are exposed;
- (ii) caries in deep pits and fissures. Areas not covered by other preventive methods are protected.

I.2 Scope of the guidelines

These guidelines concern individuals under 18 who go to see a dentist of their own accord. They cover the efficacy of and indications for pit and fissure sealants in terms of individual care. They do not deal with public health issues.

The guidelines address:

- assessing ICR
- indications for fissure sealing (first and second permanent molars)
- a clinical protocol for applying materials and monitoring sealants

The working group addressed the following questions:

- what are the risk factors for caries in relation to permanent teeth?
- what clinical criteria need to be considered in practice when assessing ICR?
- which further investigations should be considered when assessing ICR?
- how effective is pit and fissure sealing?
- does sealing have any side effects?
- what is the cost-benefit ratio for sealing?
- how should the indications for sealing be determined from efficacy and economic data?
- what is the best clinical protocol for applying sealant material ?
- how should patients be monitored after fissure sealants have been applied?

The guidelines do not address:

- clinical or radiological diagnosis of caries
- treatment for irreversible caries (non-remineralisable caries)
- other ways of preventing caries (advice on oral and dental hygiene and on diet, fluorides, chlorhexidine, xylitol, etc.).

II. Assessment method

The guidelines were produced using the method described in Annex 2:

- a critical appraisal of the literature published from 1965 to 2004.
- discussions within a multidisciplinary working group (3 meetings)
- comments by peer reviewers.
- They were graded on the basis of the strength of the evidence of the supporting studies (Annex 2). If no grade is given, they are based on agreement among professionals within the working group after taking into account the comments of peer reviewers.

III. Definitions

III.1 Pits and fissures

The irregular depressions or concavities on the surface of a tooth are formed by converging ridges which terminate at a central point at the bottom of a depression, where there is a junction of grooves. The main anatomical and histological junctions of the enamel surface (Fig. 1) are:

- the developmental grooves, situated at the intersection of the cusps which it separates;
- the supplemental groove, which goes down the faces of the cusp, which it separates into lobes;
- the terminals of the developmental grooves;
- the secondary fossa situated along the path of the main fissures (including where they intersect).

The working group decided to use the term "pits and fissures" to cover all grooves, pits or clefts in the enamel surface.

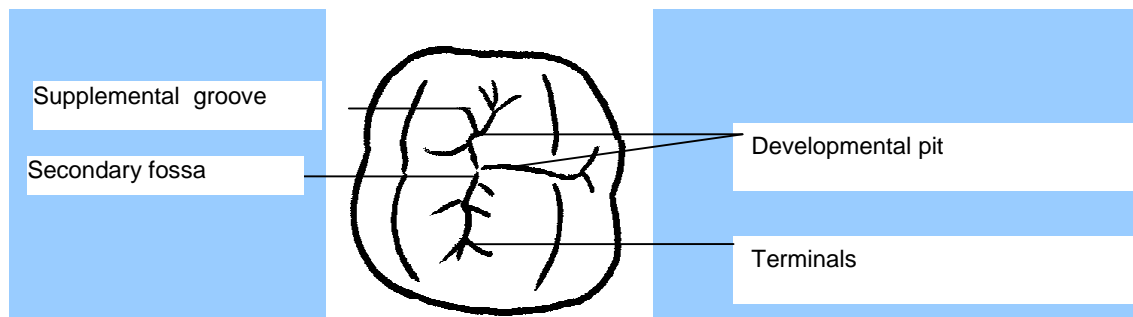


Figure 1. Junctions of the enamel surface

III.2 Deep fissures

The working group defined deep fissures as fissures that appear deep and narrow on simple clinical examination. When a tooth has a deep fissure, the faces of the cusps are often divided into lobes by numerous supplemental grooves.

III.3 Sealing

The working group defined sealing of pits and fissures as a noninvasive procedure designed to fill the pits and fissures with a fluid adhesive material. It forms a smooth, flat and watertight physical barrier which prevents bacterial plaque accumulating on the protected enamel surface and consequently prevents acid demineralisation.

IV. Caries risk

Individual caries risk (ICR) should be assessed during the first visit, particularly when there may be an indication for sealing of permanent molars (pits or fissures). It should be monitored periodically as it may change over time. It should be divided into only two categories – high and low – on the basis of history taking, clinical examination and radiological findings.

IV.1 Risk factors for caries

Risk factors for assessing ICR were identified from the literature and divided into two groups (agreement among professionals) by the working group (Table 1).

Table 1. Risk factors for caries

Individual risk factors defining individuals with high ICR		Collective risk factors defining at-risk groups	
	Level of evidence		Level of evidence
No daily use of a fluoride toothpaste	2	Posteruptive tooth age	
Regularly eating sugary snacks between mealtimes:		Low family socioeconomic and/or educational level	
- sugar-containing foods	2	Poor oral and dental health in parents or siblings	
- sugar-containing drinks	2		
- sweets	2		
Long-term use of medicines containing sugar or causing hyposalivation	-	Illness or disability causing problems with brushing teeth	
Deep fissures in the molars ^a	2	History of caries ^c	2
Plaque index ^b	2		
Presence of caries (dentine affected) and/or early reversible lesions (enamel affected) ^c	2	Presence of factors encouraging plaque retention (defective restorations, orthodontic appliances or prostheses).	

- ^a These increase the risk of caries on the occlusal surface of the tooth concerned (other individual risk factors concern all teeth)
- ^b OR presence of plaque visible to the naked eye without disclosing agents (agreement among professionals)
- ^c The DMFS/DMFT indices are risk factors for caries (level of evidence 2). Component D (untreated caries lesions that have reached the dentine) indicates current caries activity. Components M (missing tooth because of caries) and F (filled tooth) reflect caries during a period of high risk that may or may not be over.

- A single *individual risk factor* is sufficient to classify an individual in the at-risk category and to indicate fissure sealing.
- *Collective risk factors* alone cannot be used to classify an individual in the at-risk category. They are not an indication for fissure sealing. However, collective risk factors can be used to determine target populations for caries prevention campaigns.

IV.2 Saliva tests for bacteria

The salivary bacterial count test (CRT[®] - Caries Risk Test) used to determine levels of *Streptococcus mutans* and *Lactobacillus* cannot be recommended for deciding whether there is an indication for fissure sealing since the test has not yet been assessed. In addition, it costs nearly as much as sealing the teeth. Sealing has no side effects which might be a contraindication. Other tests which will shortly be introduced to the market will have to be assessed.

V. Indications for fissure sealing

- Pits and fissures in the first (grade A) and second (agreement among professionals) permanent molars should be sealed as early as possible in patients aged under 20 years with high ICR, to prevent the risk of occlusal caries, because:
 - the efficacy of resin-based sealants in preventing caries has been demonstrated in first permanent molars in patients aged under 20 (level of evidence 1). These studies did not take ICR into account;
 - the health economics literature review showed that sealing the first permanent molars was cost-effective in subjects with high ICR; however, these international studies cannot be transposed to the French situation, and they did not all use the same definition of ICR;
 - it is likely that sealants will be effective on second molars (agreement among professionals). In addition, post-eruptive mineralisation of the second molars coincides with adolescence, which is already a risk period for caries.
- There was no agreement among professionals on indications for fissure sealing in patients with low ICR. In these patients:
 - there are no specific data on efficacy
 - it has not been shown that there are any medium-term cost savings
 - however, the procedure carries no risk of complications.
- The working group emphasised that fissure sealing is not a substitute for other measures for preventing caries, but an additional protective measure. Sealants provide only local protection for the occlusal surfaces.

VI. Clinical protocol for applying pit and fissure sealants

VI.1 Caries-free surfaces

When there is an indication for sealing, the following protocol should be used.

(i) Isolate the tooth to be sealed ideally with a dental dam or use cotton wool rolls combined with suitable aspiration.

- *If isolation is satisfactory*, use a resin-based sealant.
- *If isolation is not ideal*, choose one of the following options:
 - ionomer glass sealant
 - fluoride varnish - effective but not as effective as a glass ionomer sealant (level 2)
 - postpone sealing and insist on other preventive measures.
- *If isolation is impossible*, postpone sealing and insist on other preventive measures.

If there is a problem with isolation, reassess ICR 3 months later. If the ICR remains high and satisfactory isolation has become possible, apply a resin-based sealant. If a glass ionomer sealant has been applied and is still intact, there is no point in replacing it.

(ii) Clean the teeth using a dry brush (without pumice powder or prophylaxis paste) on a slow rotary instrument or air polishing. If a dry brush is used, the teeth may be cleaned before isolation.

(iii) Condition the enamel by etching with 35-37% orthophosphoric acid for at least 15 seconds, then wash for 15 seconds and dry carefully, to obtain chalky white enamel on the surface to be sealed. Do not use an adhesive as it does not improve retention of resin-based sealing materials.

(iv) Place resin-based sealant on pits and fissures only, without spilling over.

(v) Check sealant retention before removing the isolation, using a probe. If the material comes away, the protocol should be repeated as from step (iii) (conditioning).

VI.2 Questionable caries lesions

If there is any suspicion of dentinal caries, open fissures to confirm or eliminate the diagnosis. Use a bur or air abrasion. Once fissures have been opened, restoration material must be used instead of sealant. If the caries are limited to the enamel, do not open fissures.

VII. Follow-up

Fissure sealing should be part of overall prevention. Check-ups should occur at regular intervals which depend on initial ICR:

- If initial ICR is high, the patient should be seen 3-6 months later
- If initial ICR is low, the patient should be seen once a year.

However, check-up frequency will change with changes in ICR.

During check-ups, reassess ICR and check sealant:

- if sealant has been partially lost, repair sealant to prevent plaque retention
- if sealant has been totally lost, repeat sealing process depending on ICR.

VIII. National health insurance cover for fissure sealing

Fissure sealing has been included in the French nomenclature since January 2001 for first and second permanent molars in at-risk subjects under 14, with no details of how the risk should be assessed. Only one procedure per tooth can be covered, irrespective of the number of procedures performed.

IX. Action to be taken

The working group considered that further research was called for, for instance with regard to:

- **Caries risk**
 - Carry out a cohort study in France including all known caries risk factors in a multivariate analysis, to confirm the independent risk factors to be taken into account when assessing ICR.
 - Carry out a qualitative epidemiological study to determine the distribution of risk factors for caries in the French population in order to assess this risk at community level.
 - Assess the sensitivity and specificity of the available saliva tests in France, and their benefit in assessing ICR compared with other identified risk factors.
- **Fissure sealing**
 - Owing to changes in caries prevalence, reassess the efficacy of sealant materials in preventing caries in the first molars, taking account of ICR, in randomised controlled trials (sealed versus unsealed groups) with caries frequency as main outcome measure.
 - Carry out studies of the efficacy of sealant materials on other teeth (particularly second molars, premolars and deciduous teeth), taking account of ICR.
 - Carry out a cost-effectiveness study in France in a representative population sample. The study should consider caries risk at first and second molars independently, recurrence of caries under restorations, complications of caries, repairs to sealants, and effects of follow-up (> 5 years) on costs.

- **Information and distribution**

- Information campaigns are needed, targeting the general public, i.e. patients and health professionals, preferably populations at high risk of caries.

Annex 1 – Participants

Learned societies consulted

Association dentaire française
Collège des enseignants de santé publique
(subsection 56-03)
Société française d'odontologie pédiatrique

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Assessment of caries risk and indications for pit and fissure sealants (first and second permanent molars)
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Annex 2 – Assessment method

The HAS method for producing these clinical practice guidelines¹ comprises the following steps:

Defining the scope of the guidelines (Steering committee). HAS invited representatives from learned societies concerned by the topic to take part in a steering committee whose job was to define the scope of the guidelines, to review previous work on the subject and to nominate professionals to take part in a working group or act as peer reviewers.

Literature search (Documentation Department of HAS): See below

Drafting the guidelines (Working group). The HAS project managers formed a working group of 15 professionals from a number of disciplines, working in public or private practice, from all over the country. The chair of the working group coordinated the production of the guidelines with the help of the project managers whose job was to ensure conformity with the methodological principles of guideline production. One member of the working group identified, selected, and analysed relevant studies (from a literature search performed by the HAS Documentation Department) and wrote a draft report. This draft report was discussed by the working group over 3 meetings and amended in the light of comments from other members of the working group and from peer reviewers. Proposals for future studies and action were made.

External validation (Peer reviewers). Peer reviewers were appointed according to the same criteria as working group members. They were consulted by post after the second working group meeting, primarily with regard to the readability and applicability of the guidelines (scores from 1 to 9). The HAS project managers summarized their comments and submitted them to the working group prior to the third meeting. Peer reviewers were asked to sign the final document.

Validation by the HAS Board. The Committee for Practice Guidelines and Practice Improvement validated the report. The working group finalized the guidelines with due regard to their comments.

Literature search and analysis (general procedure)

The scope of the literature search was defined by the steering committee and the project manager. The search was carried out by the HAS Documentation Department and focused on searching:

- medical and scientific databases over an appropriate period, with special emphasis on retrieving clinical practice guidelines, consensus conferences, articles on medical decision-making, systematic reviews, meta-analyses and other assessments already published nationally or internationally (articles in French or English)
- specific and/or financial/economic databases, if necessary
- all relevant websites (government agencies, professional societies, etc.)

- the grey literature (documents not identified through the usual information distribution circuits)
- legislative and regulatory texts

Further references were obtained from citations in the articles retrieved above and from working group members' and peer reviewers' own reference sources. The search was updated until the project was completed.

The articles selected were analysed according to the principles of a critical appraisal of the literature, using a checklist, to allocate a level of scientific evidence to each study. Whenever possible, the working group based their guidelines on this review of the literature. Guidelines were graded from A to C as shown in Table 1 depending on the level of the evidence of the supporting studies. If no grading is given, they are based on agreement among professionals.

Table 1. Grading of guidelines

Level of published scientific evidence	Grade
<p>Level 1 Randomised controlled trials of high power Meta-analyses of randomised controlled trials Decision analyses based on properly conducted studies</p>	<p>A: Established scientific evidence</p>
<p>Level 2 Randomised controlled trials of low power Properly conducted non-randomised controlled trials Cohort studies</p>	<p>B: Presumption of scientific foundation</p>
<p>Level 3 Case-control studies</p>	<p>C: Low level of evidence</p>
<p>Level 4 Comparative studies with major bias Retrospective studies Case series</p>	