Policy Directive

Department of Health, NSW
73 Miller Street North Sydney NSW 2060
Locked Mail Bag 961 North Sydney NSW 2059
Telephone (02) 9391 9000 Fax (02) 9391 9101
http://www.health.nsw.gov.au/policies/

Pit and Fissure Sealants: Use of in Oral Health Services NSW

Document Number	PD2008_028
Publication date	22-May-2008
Functional Sub group	Clinical/ Patient Services - Dental/Oral
Summary	Describing recommended practice and criteria for placement of pit and fissure sealants in Public Oral Health Services, NSW.
Replaces Doc. No.	Pit & fissure Sealants: Use of in Oral Health Services NSW [PD2007_008]
Author Branch	Centre for Oral Health Strategy
Branch contact	Claire Phelan 8821 4313
Applies to	Area Health Services/Chief Executive Governed Statutory Health Corporation, Board Governed Statutory Health Corporations, Affiliated Health Organisations - Non Declared, Affiliated Health Organisations - Declared, Community Health Centres, Dental Schools and Clinics, Public Hospitals
Audience	Clinical dental directors & oral health managers, dental officers, therapists & hygienists
Distributed to	Public Health System, Community Health Centres, Dental Schools and Clinics, Health Associations Unions, Health Professional Associations and Related Organisations, NSW Department of Health, Public Hospitals, Tertiary Education Institutes
Review date	22-May-2013
File No.	
Status	Active

Director-General

This Policy Directive may be varied, withdrawn or replaced at any time. Compliance with this directive is **mandatory** for NSW Health and is a condition of subsidy for public health organisations.

THE USE OF PIT AND FISSURE SEALANTS

Definition
"A fissure sealant is a material that is placed in the pits and fissures of teeth in order to prevent or arrest the development of caries".

Welbury et al, 2006

1. Introduction

1.1 The oral health of children in NSW has improved substantially over the last thirty years. This has occurred largely as a result of systematic exposure to fluorides through water fluoridation and fluoride toothpaste, improved socio-economic conditions, better nutrition, and better access to dental care.

1.2 Although dental caries is a multifactorial disease, research has consistently shown that past caries experience is the single most powerful predictor of future caries experience (Tickle et al, 2007).

1.3 Exposure to fluorides preferentially reduces smooth surface and interproximal tooth decay. The anatomy of occlusal tooth surfaces (i.e. deep pits and fissures) means that they cannot be adequately brushed or protected by fluoride administration.

2. Principles and evidence base

2.1 Occlusal caries accounts for between 80 and 90 percent of caries in children (Weintraub, 2001). The teeth at highest risk for carious lesions are the first and second permanent molars.

2.2 Extensive research indicates that sealants are effective and reliable (Ahovuo-Saloranta et al 2006). They work by keeping substrate (i.e. food and bacteria) out of pits, grooves and fissures on the teeth.

2.3 Sealants are a non-invasive preventive treatment that are easily applied by dentists, dental therapists, dental hygienists and oral health therapists.

2.4 Placing sealants in children who have high caries risk is a cost effective option for public oral health services (Weintraub, 2001; Locker and Jokovic, 2003).

2.5 Current studies support sealing with resin based sealants over Glass Ionomer Cement (GIC) sealants to prevent occlusal caries (Ahovuo-Saloranta et al 2006). However there is also evidence that suggests GIC sealants provide a similar level of protection from pit and fissure caries (Mejare and Mjor 1990; Simonsen 1996; Bezerra et al 2006). Further research is needed in this area.

3. Policy statement

Pit and fissure sealants are safe and effective in preventing dental decay in permanent teeth. Placement of sealants in children and adolescents identified as high caries risk following due clinical assessment is mandated for public oral health services.

4. Definitions of caries risk

4.1 High caries risk in children and young people is defined by those with:
- Significant physical or intellectual impairments
- dmft and/or DMFT>0
- Demineralised enamel lesions (white spots)
- Radiographic lesions (both enamel and dentine)
- Any site with plaque index = 3 (**TAB 1**) in cases where dmft/DMFT = 0
- DMFT = 0 but molars are hypomineralised or hypoplastic

4.2 It should be remembered that definitions for risk are not totally accurate and risk profiles may change over time. Clinical assessment will take into account medical and social history, past caries experience, current risk status, age and tooth surface anatomy. However, the most significant risk predictors for dental caries are:
- Previous caries history in the primary and permanent dentition (Tickle et al 2007), and
- Current level of caries activity.

5. Criteria for placing pit and fissure sealants

There are two main types of materials used in preventing pit and fissure caries in permanent teeth. These are:
- **Resin based sealants**(filled and unfilled), and
- **Glass ionomer cement (GIC) fissure sealants**

A number of considerations govern the appropriateness of resin based or GIC fissure sealing:

5.1 Ideally, sealants should be placed very soon after eruption of the molar teeth in children who have high caries risk/caries activity. However, the occlusal surfaces of permanent molars remain susceptible throughout childhood and adolescence. Placement of sealants should not be limited to soon after eruption, but considered in the light of the current caries risk of both the individual and the tooth surface.

5.2 Before placing (or replacing) a sealant on an apparently sound surface, it is important to exclude the presence of dentine lesions (**TAB 2**). This should be done through mandatory bitewing radiography and meticulous visual examination. Where caries extends into dentine the tooth should be restored.

5.3 Retention of the sealant is of prime importance in maintaining the preventive action. Therefore the ability to control moisture adequately will influence the choice of sealant material (e.g. resin based – moisture sensitive, or GIC – less vulnerable to moisture). A four-handed technique should be used for placement of either resin-based or GIC sealants (Beauchamp et al, 2008).

5.4 Isolation by rubber dam or cotton rolls are equally effective and result in similar retention rates (Locker & Jokovic, 2003; Muller-Bolla et al, 2006). Rubber dam can sometimes be employed as a positive behaviour management tool (eg. for those children who object to the taste of the materials being used).

5.5 Where pit or fissure caries is evident as either:
- demineralised enamel with no evident loss of enamel, or
- a break in the enamel surface with no extension into dentine,

sealants can prevent further caries progression by the creation of an anaerobic environment. A resin based sealant must be used in these cases.

5.6 Where a completely dry field cannot be maintained and in children who have high caries risk, placing a GIC fissure sealant is the preferred method. In this situation GIC can be considered more as a temporary fissure sealant or a fluoride release vehicle rather than a resin-based fissure sealant.

6. Additional information

6.1 Application of sealants should be part of a complete prevention program, not an isolated procedure. As an isolated procedure, patients (and parents) may misunderstand the selected area of prevention that this measure represents. **Other surfaces and other teeth still need other methods of preventive protection such as topical fluoride applications**.

6.2 Although occlusal tooth surfaces on molar teeth are particularly susceptible to caries development, in the child who has high caries risk **sealants may also be indicated for the following teeth/surfaces**:
- Hypoplastic teeth and teeth with developmental defects or weaknesses;
- Upper palatal pits of maxillary lateral incisors;
- Deep cingulum in permanent upper anterior teeth; and
- Permanent premolars with deep pits and fissures.

6.3 **Resin based sealants require monitoring**. A monitoring program should be built into treatment planning for children who receive resin based fissure sealants.

6.4 **GIC fissure sealants are useful in children who have high caries risk and/or limited cooperation as an interim preventive material** for occlusal surfaces before molar teeth are sufficiently erupted to allow conventional resin based fissure sealing (Feigal, 2006). Waiting until it is possible to place a resin based sealant increases the child's risk of developing carious lesions.

6.5 Replacement of lost or failed fissure sealants should be considered after clinical assessment of:
- The likely reasons for the loss or failure;
- The possibility of dentine caries being present;
- The current caries risk status and age of the child; and
- The likelihood of successful replacement or repair.

7. References

Ahovuo-Saloranta A, Hiiri A, Nordblad A, Wothington H, Makela M. Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents (Review). The Cochrane Database of Systematic Reviews. 2006. Published by John Wiley & Sons Ltd.

Beauchamp J et al. Evidence-based clinical recommendations for the use of pit and fissure sealants: A report of the American Dental Association Council on Scientific Affairs. Journal of American Dental Assoc (JADA), Vol 139, March 2008

Bezerra AC, Mickenautsch V, Yengopal V, Leal SC, Mtetwa R, Cruvinel VRN. Glass ionomer based fissure sealants: a systematic review. Clinical trials program presentation, IADR Brisbane 2006

British Society of Paediatric Dentistry: a policy document on fissure sealants in paediatric dentistry. International Journal of Paediatric Dentistry 2000; 10: 174-177

Feigal, RJ & Donly KJ. Conference Paper: The use of pit and fissure sealants. Paediatric Dentistry 28:2 2006

Locker D, Jokovic A. The use of pit and fissure sealants in preventing caries in the permanent dentition of children. British Dental Journal 2003 Vol 195, No 7

Mejare I, Mior IA. Glass ionomer and resin based fissure sealants: a clinical study. Scandinavian Journal of Dental research 1990; 98(4):345-350

Mulla-Bolla M, Lupi-Pegurier L, Tardieu C, Velly A, Antomarchi C. Retention rates of resin based sealants: a systematic review. Community dent Oral Epidemiol. 2006; 34:321-336

Simonsen RJ. Pit and fissure sealant: a review of the literature. Pediatric Dentistry 2002 Sep-Oct; 24(5):393-414

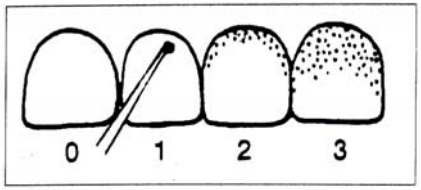
Tickle M, Threlfall AG, Milsom KM, Blinkhorn AS. *The occurrence of dental pain and extractions over a three year period in a cohort of children aged 3-6 years*. Journal of Public Health Dentistry, 2007

Weintraub JA. Pit and fissure sealants in high-caries risk individuals. Journal of dental education, 2001 Vol 65, No 10.

Welbury R, Raadal M, Lygidakis N. Guidelines on the use of pit and fissure sealants in paediatric dentistry: a European Academy of Paediatric Dentistry (EAPD) policy document 2006

TAB 1: Plaque index scores

Plaque Index (Silness & Loe, 1964)



3 = ***thick*** plaque is clearly visible along gingival margin of wet teeth

2 = plaque is ***visible*** along gingival margin, with or without air drying (no need to probe)

1 = following air drying, plaque is ***not visible***, but ***can be picked up*** with an explorer

0 = following air drying, plaque is ***not visible*** and ***cannot*** be picked up with an explorer

Notes: (1) If an index tooth is missing, score the nearest tooth in that sextant. If there are no teeth in the sextant, enter X.

(2) If the plaque thickness varies along the gingival margin of a surface, score according to the worst situation.

(3) The overall score is the sum of the 12 surface scores (minimum of 0 and maximum of 36)

Date _____

	16	11	26
Buccal Surfaces			
	46	41	36

	16	11	26
Lingual Surfaces			
	46	41	36

Score _____

Acknowledgement: Bachelor of Oral Health Program, Faculty of Dentistry, University of Sydney

TAB 2: Placement techniques for pit and fissure sealants

The first and most important step prior to applying fissure sealants is to exclude the presence of dentine caries. A dentine lesion is diagnosed through:

- Mandatory bitewing radiographs that reveal a dentine radiolucency beneath a pit or fissure; and
- Meticulous visual examination where a cavity that extends into dentine is evident.

These lesions should be restored.

Material Selection

Current evidence available on the retention rates of different types of sealants indicates the following :

- Autopolymerising (chemically cured) sealants and visible light curing sealants have similar retention rates.
- The addition of filler particles to the sealant appears to have little effect on clinical results. Filled and unfilled sealants penetrate the fissures equally well (Feldens, Feldens, de Araujo, et al, 1994), demonstrate no difference in micro-leakage (Park, Georgescu, Scherer, Schulman, 1993) and have similar retention rates.
- Fluoride-containing visible light cured sealants have only been evaluated in short term studies but have retention rates similar to autopolymerising and light cured sealants for the equivalent follow-up periods (Locker & Jokovic, 2003). It is still to be determined whether or not the incorporation of fluoride leads to further reductions in caries incidence or enhances the inhibition of incipient or inadvertently sealed caries.
- Unfilled resins are available as clear or opaque. Cameron and Widmer (2003) advise the use of opaque sealants so that they can be detected by other clinicians who may treat the patient. Clear sealants show stains in the fissures that are most likely inactive caries. Upon seeing these stains, other clinicians may decide to investigate the stains, therefore defeating the initial purpose of the sealant.
- Retention rates for glass ionomer cements are not as favourable as those for resin-based sealants (Locker & Jokovic, 2003) however, these materials contain fluoride and therefore, have a caries preventive effect. They are ideal for partially erupted teeth where resin-based sealants are unable to be placed due to the inability to create a moisture-free environment (it must be remembered that without this treatment these teeth may become carious by the time they have become accessible enough to place a resin-based sealant).

Sealant Application

Each sealant material requires specific techniques for their designed adhesion onto enamel.

- Resin-based sealants rely on a micromechanical bond made possible by use of an acid-etch technique which creates micro pores in the enamel that interlock the resin and enamel (Slough, 2006).
- Glass ionomer sealants bond chemically to the enamel without the use of the acid-etch technique, which makes them less vulnerable to moisture. They can

also interact with enamel and release calcium, strontium and fluoride ions, which may have cariostatic actions and reduce the likelihood of primary caries development on a sealed surface (Walsh, 2006).

To ensure successful placement it is essential that the following placement techniques described for each material are adhered to:

1. Unfilled Resin

- Consult a recent bitewing radiograph (within 6 months) to exclude the presence of any dentinal caries.
- Isolate the tooth with the help of a Dental Assistant to ensure a dry field. If a moisture free environment cannot be assured, consider the use of Glass Ionomer Cement.

> *Adequate isolation is the most critical aspect of fissure sealant application (Harris and Garcia-Godoy, 1999). If the enamel porosity created by the etching procedure is filled by any type of liquid, the formation of resin tags in the enamel is either blocked or reduced, resulting in poor retention of the sealant. In the event of moisture contamination re-etching of the surface is indicated.*

- Remove gross debris if present with a prophy brush using oil-free pumice and water (Note: prophy paste must be fluoride free to aid in etching).

> *It is important to make sure that the tooth surfaces and fissure areas are free of gross plaque and debris that might interfere with the etching process or sealant penetration.*

- Apply acid etch to the surfaces to be sealed.

> *The most frequently used etchant material is 37 percent orthophosphoric acid. The etchant should be applied onto all the susceptible pits and fissures of the tooth and extended up the cuspal inclines well beyond (at least 2 millimetres) the anticipated margin of the sealant. Etching for 20-30 seconds is now fairly standard (refer to manufacturer's recommendations for product being used.*

- Thoroughly rinse and dry the tooth.

> *Waggoner and Siegal (1996) consider that exact washing and drying times are not as important as ensuring that both washing and drying are thorough enough to remove all etchant from the surface of the tooth to give a chalky, frosted appearance. If, after several seconds of air drying, the tooth does not become frosted, it will need to be re-etched.*

- Apply a thin coat of the sealant material to pits and fissures making sure to include the buccal extension on lower molars and the palatal groove in upper molar teeth.

Care should be taken not to extend the sealant beyond the etched area as this will place the margins at risk of leaking and / or staining. During application of the sealant material small bubbles may form in the material. These should be removed with a small brush or the tip of the probe prior to polymerisation.

- Apply the white polymerisation light.

The tip of the light should be held as closely as possible to the sealant. The manufacturer's recommendations for polymerisation times should be adhered to. If light activation time is insufficient, poor bonding and subsequent failure of the sealant may result.

- Check sealant with a probe to ensure the integrity of the sealant and that the margins are sealed.
- Remove the rubber dam (if utilised) and check the occlusion with articulating paper.
- If necessary adjust with composite finishing bur.
- Monitor sealants through annual recall. If monitoring is not possible GIC sealants provide an alternative treatment.

2. Glass Ionomer Cement

- Consult a recent bitewing radiograph (within 6 months) to exclude the presence of dentinal caries.

- Isolate the tooth with the help of a Dental Assistant to ensure a dry field.

One of the main clinical advantages of GIC is its ability to bond chemically to dentine and enamel without the use of the acid-etch technique, which makes it less vulnerable to moisture. The other clinical advantage of GIC is the active fluoride release into the surrounding enamel.

- Remove gross plaque if present.

- Apply conditioner for 10-20 seconds (adhere to manufacturers instructions for individual products).

This step will remove plaque and pellicle and reduce the surface energy of the enamel to allow the cement to adapt readily and develop a good adhesion.

- Wash the tooth thoroughly and dry lightly.
- Apply the glass ionomer material to all pits and fissures.
- Place a thin layer of unfilled resin over the surface of the GIC and light cure for the manufacturer's recommended time.

The placement of unfilled resin over the GIC will protect the material from moisture contamination.

- Check the occlusion with articulating paper.
- If necessary adjust with a composite finishing bur no water spray.
- If adjustment is required, reapply another layer of bond and light cure.

References

Cameron, A. & Widmer, R. (Eds). (1997). Handbook of Paediatric Dentistry. London: Mosby.

Feldens, E.G., Feldens, C.A., & de Araujo, F.B et al. (1994). Invasive technique of pit and fissure sealants in primary molars: an SEM study. J Clin Pediatr Dent, 18 (3), 187-190.

Harris, N.O, & Garcia-Godoy, F. (1999). Primary Preventive Dentistry. (5th Ed). London: Asimon and Schuster Company, cited in Welbury, R., Raadal, M., & N.A. Lygidakis. (2004). EAPD guidelines for the use of pit and fissure sealants. European Journal of Paediatric Dentistry, 3, 179-184.

Locker, D., Jokovic, A., & Kay, E.J. (2003). Prevention. Part 8: The use of pit and fissure sealants in preventing caries in the permanent dentition of children. British Dental Journal, 195 (7), 375-378.

Park, K., Georgescu, M., Scherer, W., & Schulman, A. (1993). Comparison of shear strength, fracture patterns and microleakage amonf unfilled, filled and fluoride-releasing sealants. Paediatr Dent, 15, 418-420.

Silness, J. & Loe, H. (1964). Periodontal disease during pregnancy. II. Correlation between oral hygiene and periodontal condition. Acta Odontol Scand, 22:121-135.

Slough, T. (2006). Auxiliary Education Programme. Module 19 – Fissure Sealants. Auxiliary, Sep/Oct, 18-20.

Walsh, L.J. (2006). Pit and fissure sealants: current evidence and concepts. Dental Practice, Nov/Dec, 122-124.

Waggoner, W.F., & Siegal, M. (1996). Pit and Fissure Sealant Application: Updating the Technique. JADA, 127, 351-361.

Professor Debora Picone AM
Director-General