

# Caries

## SEALANTS AND CARIES CONTROL

*Sealants provide 'physical' protection of the tooth structure against cariogenic factors and can be placed without the need to remove tooth structure. They contribute significantly to the dental profession's ability to provide caries prevention and non-invasive caries management for selected individuals. All this can lead to reduced loss of tooth structure and promote long lasting healthy dentition (McIntyre, 1994).*

*Preventive dental programs introduced for the population at high risk of developing dental caries can result in significant improvement in oral health (Morgan et al 1998). Dental sealants form an extremely useful group of preventive measures that can be incorporated into such preventive programs, but they are not widely used throughout most industrialised countries, including Australia (Manton and Messer, 1995). Overall, there seems to be a need within the dental profession to revisit the issue of sealants, their role in the prevention of dental caries, and how and when they should be used (Burt, 1998; Gilpin JL, 1997).*

### The range of use of sealants

The potential range of uses of sealants includes not only protection of pits and fissures against development of caries, but also sealant restorations, protection against erosion, and protection of cervical surfaces. Pitts (1991) also proposed use of interproximal sealants, though their placement may be difficult.

Application of cured transparent dentine bonding materials is very useful where there is an erosive component in the caries aetiology. The erosive component is often associated with excessive consumption of acidic beverages or chronic gastric reflux and is frequently difficult to control.

Some older adults experience high levels of root caries. The decay in this group often occurs as a result of a sudden change in lifestyle or illness. Such a change can possibly lead to unfavourable dietary changes often complicated by reduced ability to apply other caries preventive measures (Practice Information Sheet No. 4). In these cases, root surfaces at risk can be sealed with GIC or resin materials to minimise risk of caries development.

Sealants can also be used to provide protection against recurrent caries around rough margins in old restorations. Not all faulty restorations lead to recurrent decay, but poor margins usually require the whole restoration to be replaced. For a restored tooth with no recurrent decay and in a low caries risk mouth, sealants may offer a treatment option in order to repair a faulty margin to eliminate an area of plaque retention.

### The rationale for sealant use in the control of caries

While children enjoy significant reduction in caries experience, there is no evidence that this achievement continues into the adolescent/adulthood years (Barnard, 1993). Various reasons are postulated to play a role in this phenomenon. It is likely that young adults' lifestyles result in unfavourable dietary pattern including high consumption of sweet foods or drinks. Irregular main meals, which are common in this age group, may lead to increased frequency of snacks that are also likely to be sweet (Practice Info Sheet No. 4).

The low decay rate in children in Australia has been achieved through population preventive strategies such as water fluoridation, widespread use of toothpaste with fluoride or improved oral health education. However, for some groups in our population, these approaches are not enough and these groups require special individual caries preventive programs.

*It is essential to identify individuals at higher risk of developing caries and concentrate preventive efforts on them.*

For example, the high caries experience in the 15-30 age group in Australia is confined to only a proportion of that age group (Practice Info Sheet No. 4, 2000; Barnard, 1993). In most cases, high caries risk can be identified earlier in life (Greenwell et al 1990). *Where risk factors are detected early, and where compliance with dietary, plaque control and topical fluoride self application measures is considered unreliable, use of sealants can assist in providing protection against the development of caries.*

As it is discussed later, sealants are not only of benefit to children and young adults, but they have a role in prevention for all age groups including the elderly.

## Case selection

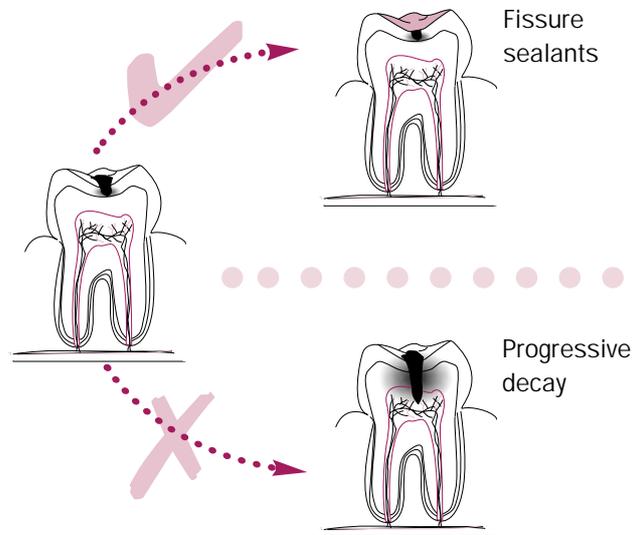
In the early days of sealants, sealing all occlusal surfaces of all posterior teeth in every child's mouth was considered an appropriate preventive approach. In a community like Australia, where caries prevalence in children is low, the cost of such an approach is very high and the provision of sealants to low caries risk patients is now considered to be unnecessary.

*However, provision of sealants to selected at risk children has been shown to be successful and cost effective (Morgan, 1998).*

Selection of children to receive sealants is not as straightforward as one might hope. Past caries experience can indicate to a practitioner that a child has previously suffered from caries and that risk for future caries may still be high. In these children, surfaces with deep fissures and developmental grooves in erupting permanent teeth might be considered at high risk of decay. Where children have reached adolescence without caries, the first signs of caries development on any tooth surface should raise the issue of considering sealants, especially on occlusal surfaces of permanent molars (Eklund and Ismail, 1986; Stahl and Katz, 1992). Dietary risk factors and inadequate plaque control may also indicate the need for sealants for caries prevention.

Where early signs of caries development are detected, a combination of preventive resin restorations and fissure sealants is strongly recommended (Elderton, 1994). The detection of cervical decalcification is often diagnostic of frequent soft drink or fruit juice consumption, even when plaque control is adequate. When the patient's continuing compliance with preventive measures is not certain, sealing decalcified surfaces with a sealant is useful and should be done parallel with attempts to achieve dietary change and remineralisation of lesions with topical fluorides. Sealants in these cases will protect teeth for a period of time during which the underlying risk factors are being reduced or eliminated.

*Fissure sealants can successfully prevent progression of caries (Thylstrup and Fejerskov, 1994), therefore sealing of the very superficial lesion is a viable option compared to the more destructive conventional restorative approach, which involves the removal of healthy tooth structure to gain good access.*



## Sealants and other preventive methods in caries control

Sealants and professionally- or self-applied fluorides are individual caries preventive measures. These methods are only likely to be successful if a case is selected and managed carefully. The most obvious difference between sealants and fluoride use in patient management is the issue of compliance. Topical fluorides will only be successful if a patient is motivated, follows the clinician's advice, and makes the necessary behavioural or dietary changes. Self-applied fluorides can sometimes facilitate the

recommended changes in patients' lifestyle. Because these measures require regular applications, they remind the patient of all other elements of the clinician's advice.

In contrast, sealants do not require any behavioural change from the patient and they do not stimulate a patient to change.

*Therefore, to achieve long-term results sealants should not be used as a 'quick fix' for a patient's decay problem.*

Sealants must be used in conjunction with other elements of a caries management plan which lead to desirable behavioural changes.

Some may argue that this is a negative side of sealants. However, there are circumstances where sealants may be the only option for individual caries prevention, for example in the case of some young or older adults going through fundamental lifestyle or environment changes, where temporarily compliance with other preventive measures is not expected to be high. In these cases, sealants may just be the most effective means of protecting teeth from damaging factors during the period of instability.

## Requirement for placement procedures

One reason often given for not using sealants is the claim of poor long-term retention. Success of sealants relies on the material staying intact on the surfaces they protect. Early surveys showing poor retention rates led to the recognition that careful placement technique was essential to long-term retention (Bagramian et al, 1979). More recent reports have shown retention rates of up to 15 years where fissure sealants have been carefully placed (Simonsen, 1991).

One of the requirements for successful sealant retention is thorough **moisture control** (Donnan and Ball, 1988). For this reason, it is important not to use sealants unless moisture control can be guaranteed. Moisture control makes placement of sealants in young children difficult, even when the permanent teeth have fully erupted. Deciduous teeth are not good candidates for sealants as poor fissure definition and flat occlusal tables make retention difficult.

To ensure a good bond when placing sealants, it is important to increase **etching time** in individuals where fluoride has been frequently used. Professional topical fluoride application should not be carried out for some weeks prior to application of sealants.

Thorough **cleaning of the surface** prior to acid etching, with careful pumice polishing, is essential for successful bonding (Donnan and Ball,

1988). It is also important to dry the surface before sealing as moisture trapped in fissures may compromise the longevity of the seal.

**Coverage** of an area at least one millimetre beyond any fissures or developmental grooves, including the entire occlusal surface, when sealing a fissure is also very important. Again it is essential that no saliva come in contact with the etched surface prior to resin placement. Finally, after the sealant is placed, it is necessary to ensure that **occlusal contact** is correct and the bite is comfortable. Even though these steps are time consuming, they are no different to those required for satisfactory placement of any light-cured restorative material.

Air abrasion is recommended by some as a step in fissure sealing. At this stage, there is no evidence of any superior bonding strength achieved by using this method and the longevity of sealants placed with this method has been found to be inferior (Kanellis et al 2000).

## The preventive resin restoration

Preventive resin restorations are an extension of the sealant technique that allow for caries control with minimal loss of tooth structure. This method is indicated where caries within a fissure has just reached the dentine. Under ideal circumstances the **fissure sealants can successfully prevent progression of caries (Thylstrup and Fejerskov, 1994)**, therefore sealing of the very

superficial lesion is a viable option compared to the more destructive conventional restorative approach, which involves the removal of healthy tooth structure to gain good access. For early decay, where space allows, glass ionomer veneered with unfilled resin should be used.

The main difficulty in determining the optimal form of management for an early decay lesion is the diagnosis of the state of the fissure. Laser fluorescent diagnostic probes and digital imaging equipment may eventually improve the practitioner's diagnostic accuracy on the presence and the depth of caries in occlusal pits, fissures and developmental grooves. At this stage it is not clear whether these methods differentiate between infected and affected dentine, and lack of differentiation can lead to inappropriate cavity management.

The management of these doubtful occlusal fissures has now become a dilemma facing dental practitioners every day in the clinic. Recommendations to use air abrasion techniques to open up all suspect fissures and grooves does not fit well with current minimal intervention philosophy, even though it may be the easiest solution for the practitioner. The decision on what is best for the patient involves a complex mix of clinical diagnostic skills, estimates of overall caries risk for the individual patient, and assessment of the patient's interest and likely compliance with preventive behaviours (Elderton, 1994).

## Dental team members and their role in successful caries management using sealants

*The skills of all dental team members can be utilized in caries prevention involving the use of sealants. A dentist or a dental therapist is usually responsible for case selection, examination and placement of sealants, but dental hygienists may also be involved in placing sealants and in other aspects of caries management (range of services vary from state to state). The reception area can*

*be set up to make appropriate dental literature available to waiting patients. The receptionist or dental assistants can encourage patients to read dental education materials and to refer all patients' inquiries to the appropriate clinician. Teamwork of all staff members of the surgery will contribute to successful treatment outcomes.*

# Sealants and a successful caries management program

*There are some vital steps to follow when considering sealants as a caries management option.*

- Identification of a **patient at risk** of decay. It is important to use sealants only on patients that need individualised caries preventive methods. Although sealants do not damage tooth structure and do not 'harm' a tooth, they do not need to be applied to teeth of caries inactive patients where the remineralization is established. **Provision of such services to patients at low risk may be considered as over-servicing.**
- A thorough **assessment of all aspects of a patient's life** affecting the development of caries. No long-term caries management program will be successful if underlying causes are not recognised or remain unchanged and factors promoting demineralization continue to prevail.
- Appropriate **oral examination** to determine tooth surfaces at risk. It is important to distinguish between teeth that may just need sealants and those requiring restorative management. Intact sealants will temporarily stop the decay process underneath, but when sealants are even partially lost a carious lesion will become active again and will progress.
- Appropriate **technique** and manufacturers' guidelines need to be followed. Good moisture control is necessary to ensure long-term success.
- Steps need to be taken to ensure reversal of the decay balance from demineralization to remineralization. All risk factors detected during the examination need to be addressed and methods of controlling or eliminating them discussed with the patient. These methods will often require use of additional fluoride at home.
- **Monitoring** and repair. Just like any other caries management program, sealants need to be monitored and assessed for deterioration and if necessary repaired. This can be easily achieved during follow-up and review visits included in the management plan.

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## Further information

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