

Recent Advancements in Pit and Fissure Sealants: A Monograph

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Review Article

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Abstract: Dental caries is very common in children. The pit and fissure sealants are materials placed on tooth surface to prevent development of caries. They have been used to protect deciduous tooth and newly erupted permanent tooth. With time, newer modifications have been done in order to improve the results pertaining to durability and retentiveness. This review deals with newer advancements in pit and fissure sealant materials.

Keywords: Pit and fissure sealants, dental caries, preventive dentistry.

INTRODUCTION

Dental caries is a multifactorial disease caused by alteration in the composition of the bacterial biofilm, leading to an imbalance between the demineralization and remineralization processes and manifested by the formation of caries lesions in primary and permanent dentitions [1]. Even in the 21st century, dental caries is considered a global burden, severely upsetting the health and quality of life of those affected [2].

The term pit and fissure sealant is used to describe a material that is introduced into the occlusal pits and fissures of caries-susceptible teeth, thus forming a micromechanically-bonded, protective layer cutting access of caries-producing bacteria from their source of nutrients [3]. Pit and fissure sealant is an effective means of preventing pit and fissure caries in primary and permanent teeth. Dentists should therefore be encouraged to apply pit and fissure sealants in combination with other preventive measures in patients at a high risk of caries.

Selection of sealant material is dependent on the patient's age, child's behavior, and the time of teeth eruption. Teeth that present with early non-cavitated carious lesions would also benefit from sealant application to prevent any caries progression. Sealant placement is a sensitive procedure that should be performed in a moisture-controlled environment. Maintenance is essential and the reapplication of sealants, when required, is important to maximize the effectiveness of the treatment [4].

Classification of Pit and Fissure Sealant

Mitchell and Gordon (1990) stated that sealants can be differentiated in the following ways:

Polymerization methods

- Self-activation (mixing two components)
- Light activation
- First generation sealants: UV light activated
- Second generation sealants: Chemically cured
- Third generation sealants: Visible light cured
- Fourth generation: Fluoride containing sealants

Resin systems

- Bis-GMA
- Urethane acrylate

Filled and Unfilled Clear and Tinted

Requisites of an efficient sealant [5]

- A viscosity allowing penetration into deep and narrow fissure even in the maxillary teeth.
- Adequate working time.
- Rapid Cure
- Good and prolonged adhesion to the enamel.
- Low sorption and solubility.
- Resistance to wear.
- Minimum irritation to tissues.
- Cariostatic Action.

Clinical technique

STEP 1: Isolate tooth surface from salivary contamination.

STEP 2: Tooth preparation

STEP 3: Etching.

Step 4: Rinse and dry etch.

STEP 5: Application of sealant material.

STEP 6: Explore the sealed tooth surface.

STEP 7: Evaluate the occlusion of the sealed surface.

Step 8: Periodically reevaluate and reapply sealant as necessary

Recent advances in Pit and Fissure Sealants

Fluoride releasing flowable resin

Compared with conventional fissure sealant, using fluoride releasing flowable resin as a fissure sealant in children enamel caries of permanent molars can improve the sealant preservation rate and effectively prevent enamel caries progress. In a study done by Yan WJ *et al.* the clinical effect of fluoride releasing flowable resin used in treatment of early enamel caries of children was compared with conventional sealant. At the end of 12 and 24 months, more significant decrease of caries progress incidence was observed in the fluoride releasing flowable resin group than in the control group, and there was statistical difference between the two groups [6].

Nanocomposites as pit and fissure sealants

According to the study carried out by Singh S *et al.* nanocomposite were found to be an excellent dental material for penetration in deep pits and fissures, though it exhibits mild microleakage. Hence, it can be recommended for use in pediatric dental patients, as a pit and fissure sealing agent [7].

Enamel Deproteinization and Intermediate Bonding in the Retention of Pit and Fissure Sealants: Enamel deproteinization along with the use of intermediate bonding layer significantly enhances the retention of pit and fissure sealants in terms of enhanced marginal integrity, decreased marginal discoloration and preserving the anatomical form as confirmed by the study done by Rishika *et al.* [8]

Polyacid-Modified Resin Based Sealants

Polyacid-modified, resin-based composite material, which is also referred to as compomer, has been used as a fissure sealant. It combines the advantageous properties of a visible light polymerized resin-based sealant with the fluoride releasing property of the GI sealant. A polyacid-modified resin-based sealant has a better adhesion property to enamel and dentin and is also less water-soluble, compared to GI sealant material, and less technique-sensitive, compared to resin-based sealants [9].

Colour Changing Sealants

In March 1977, the first colored sealant (3M's Concise White Sealant) was introduced to the market. It is easier to see the sealant during application, and it is faster and easier to assess with a white sealant than with a clear sealant at later time intervals [8]. While a Helioclear material, which changes color from clear to green when exposed to a visible light, has some clinical utility, particularly on subsequent follow-up examinations.

Hydrophobic and Hydrophilic pit and fissure sealants

Ratnaditya A *et al.* did a study to compare and evaluate the retention of the traditional hydrophobic pit and fissure sealant with a hydrophilic resin-based sealant on first permanent molars and to compare the sealant retention in maxillary and mandibular first permanent molars. It was concluded that hydrophilic sealant may be used as effective pit and fissure sealants especially in children with high risk of caries, excessive salivation, mentally and physically challenged, very young children, uncooperative child and partially erupted molars and community care programs [9].

CONCLUSION

Pit and fissure sealants have been used to seal the initial carious lesions/ cavitated surfaces since a very long time. With the advent of time, they have undergone modifications in order to improve their durability and retentive qualities. The use of pit and fissure sealants as preventive measures should be routinely carried out under school oral health promotion programs.

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