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Original Research

Pit and Fissure Sealants: A Clinical Review

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ABSTRACT:
The complex morphology of the occlusal pits and fissures warrants an ideal site for the retention of bacteria and food remnants, rendering proper oral hygiene maintenance difficult. Sealants have been shown to protect the occlusal surfaces, inhibit bacterial growth, and provide a smooth surface, thus increasing the probability that the surface will stay clean. The aim of present review article is to discuss pit and fissure sealant in detail
Keywords: Pit and fissure sealants, Pit and fissure, Dental caries

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INTRODUCTION

Dental caries remains as one of the most widespread disease of mankind. It is the single most common chronic childhood disease. Caries in children begins shortly after eruption of the teeth and continue to increase at a remarkable rate in their school age. Deep pits and fissures favour food retention and are difficult to clean by routine brushing. It provides a favourable environment for the oral microorganisms to thrive and convert the carbohydrates to acids, leading to demineralization of the enamel.[1] Pit and fissure caries account for approximately 80%–90% of all caries in the permanent posterior teeth and 44% in the primary teeth.[2]

Pit and fissure sealant acts on the susceptible teeth by micromechanically bonding to the tooth preventing access by cariogenic bacteria to their source of nutrients, thus reducing the risk of caries in those susceptible pits and fissures.[3]

Sealant application is a preventive conservative approach involving the introduction of sealants into the pits and fissures of caries prone teeth; this sealant then bonds to the tooth micromechanically, providing a physical barrier that keeps bacteria away from their source of nutrients.[3] Thus, the aim of present review article is to discuss pit and fissure sealant in detail.

Classification of Pit and Fissure sealants[1,4,5,6]

Based on Filler Content	Based on the color of the sealants	Based on generation
Filled and unfilled resin systems in regard to the presence or absence of filler particles in the system.	Transparent and opaque	**First generation** • UV Light polymerization **Second generation** • Self polymerization **Third generation** • Visible light polymerization **Fourth generation** • Additional fluoride release

Indication and Contraindication of Sealants[7,8]

Criteria	Indication	Contraindication
Tooth age	Recently erupted	Tooth remains caries free for more than 4 years
Tooth type	Molar	Premolar except when caries risk is high
Occlusal morphology	Deep narrow retentive pit and fissures	wide self-cleansing pit and fissures
Status of proximal surface	Sound	Carious
General caries activity	Many occlusal lesions few proximal lesions	Many proximal lesions
Other preventive measures	Patient receiving approach systemic and topical F therapy and are still caries active	

CLINICAL PROCEDURE

ISOLATION OF TOOTH

Moisture control is the most crucial aspect of the pit and fissure sealant placement, and therefore absolute isolation using a rubber dam is preferred. As a result of inadequate isolation, the enamel porosities formed during etching can be filled by any fluid blocking the resin tags, decreasing the retention of the material. There are cases where absolute isolation is not possible, or it is not practical, like in the case of newly erupted teeth due to the need for local anesthesia to place the clamp. In such cases, a dry field can be achieved by cotton rolls and isolation shields, and clever use of the evacuation tip.[9]

ACID ETCHING

The most critical step in sealant application technique is acid conditioning or acid etching procedure. Etching enhances the tooth's receptivity to bonding with the sealant. During this critical step, meticulous maintenance of a dry tooth surface is essential for bonding to be successful.[10]

STEPS OF ETCHING

- Most frequently used: 37% orthophosphoric acid (gel)
- Gel applied either directly with special application tips or with a small disposable brush
- Should be applied to all the susceptible pits and fissures and extend up to cuspal inclines
- Etch for 15 seconds for permanent molars, 15 to 30 seconds for primary teeth. Teeth with dental fluorosis require additional etching time
- If glass ionomer cement is being used, etching is not required, and a surface conditioner may be used
- Rinse well with air-water spray
- Dry the tooth with uncontaminated compressed air until a frosty white opaque appearance is seen
- If cotton roll isolation has been used, replace cotton rolls
- If this appearance is not seen, repeat acid etching
- If the surface becomes contaminated, re-etching must be done[11]

RINSE AND DRY THE TOOTH

A rinsing time of 30 s and drying the tooth for 15 s should be sufficient to remove all acid etchant residues and achieve the characteristic chalky white enamel frosty appearance.[12]

BONDING AGENTS

The idea of using a bonding agent under the sealant came from Feigal et al. in 1993 when they used hydrophilic bonding materials to aid the bond strength when the sealant is applied in a moist environment.

There have already been eight generations of bonding agents, the latest and eighth one being introduced in 2010. It is characterized by the incorporation of nano-fillers into the adhesive composition to improve the mechanical properties of the adhesive system.

However, the most recent type in adhesive dentistry is called the universal adhesive or the multi-mode adhesive. This kind of adhesive system can be used as an etch and rinse adhesive, a self-etch adhesive or to do self-etch on dentin and etch-and-rinse on enamel; this particular technique is called selective enamel etching. Its composition differs from the other adhesive systems that allow chemical and micromechanical bonding.[13,14]

APPLICATION OF SEALANT

During sealant application, all the susceptible pits and fissures should be sealed for maximum caries protection. This includes buccal pits of mandibular molars and lingual grooves of maxillary molars. The sealant material can be applied to the tooth in a variety of methods. Many sealant kits have their own dispensers, some preloaded that directly apply the sealant to the tooth surface. Some common problems occur during sealant application. Small bubbles may form in the sealant material. If these are present, they should be teased out with a brush before polymerization. Unfilled sealants have a low viscosity that makes them prone to pooling in the distal pit area of maxillary molars due to patient position and gravity. This can be rectified by applying the sealant judiciously or by removing excess amounts with a brush.[1]

SEALANT EVALUATION AFTER PLACEMENT

After curing the sealant and before the removal of the isolation material, the operator should examine the sealant for any voids, bubbles, or deficient material. Sealant retention should also be checked using the explorer in attempt to remove the sealant. If the sealant is dislodged, the fissures should be re-checked for any remaining food debris that may have caused the debonding of the sealant material. The tooth should be re-etched and a new sealant material should be applied. The operator should also be cautious enough to remove excess sealant material over the distal margin that may create a ledge.[15]

REVIEW OF LITERATURE

Author	Observation
Bandi M et al. (2020)[16]	Sealant application with bonding agent showed an increased retention rate than without the use of a bonding agent.
Hegde R et al. (2016)[17]	Author evaluated an individual method of cleaning and preparing occlusal fissure surface before placement of pit and fissure sealant. He found that the pumice slurry and surface conditioning showed a significantly higher retention when compared to the brushing group, whereas the control group (without any preparation) showed the least retention when compared to all the other methods.
Singh C et al. (2019)[18]	Study was conducted to compare the retention of resin-based pit and fissure sealant to flowable resin composition occlusal pits and fissures of all first permanent molars with and without air-abrasion over a 12-month follow-up. He found that flowable composite was relatively better retained than sealant at 12 months' follow-up although results were statistically insignificant. Air abrasion followed by acid etching brought superior retention than acid etching.
Kumar G et al. (2016)[19]	Er,Cr:YSGG laser etching is comparable to acid etching in terms of retention and patient acceptability.
Kumaran P et al. (2013)[20]	The retention rates of resin-based sealants were superior to that of glass ionomer sealant.
Cvikl B et al. (2018)[21]	The main recommendations are that sealing pit and fissures of primary and permanent teeth is safe and effective both in preventing and in arresting caries. However, the long-term success is dependent on regular checkups and the renewal of the sealing if required.
Jaafar N et al. (2020)[22]	Resin-based fissure sealant with fluoride releasing properties preferable in preventing caries progression of incipient non-cavitated carious lesions in fully-erupted teeth.

DISCUSSION

Teeth can be classified as sound or at risk based on the basis of clinical studies. Pit, fissure, and grooves can be observed using a dental mirror and explorer. The concept of detection of pit and fissure caries using sharp explorer has been discarded in favour of the visual appearance of enamel. Even with newer technologies of caries detection it is difficult to chart the disease progression.[23]

Pit and can be classified according to their cross-sectional appearance, namely-V-type, U-type, and I-type. It is impossible to clean the shape of the pit and fissure in most of the cases. Bacteria and food are compacted into occlusal surface explaining the high susceptibility of pit and fissure caries.[24]

For prevention of caries, sealants are accepted as the more effective method. Tooth caries can be prevented as long as the sealant adheres to the tooth surface and, for this reason; the success of sealant is measured by the length of time the sealant remains in the tooth. Salivary contamination during sealing placement is the commonest reason for sealant failure.[25,26]

CONCLUSION

Pit and fissure sealant is an effective means of preventing pit and fissure caries in both primary and permanent teeth. Dental professionals should 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.

REFERENCES

1. Babu G, Mallikarjun S, Wilson B, Premkumar C. Pit and fissure sealants in pediatric dentistry. SRM J Res Dent Sci 2014;5:253-7.
2. Beauchamp J, Caufield PW, Crall JJ, Donly K, Feigal R, Gooch B, *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. J Am Dent Assoc 2008;139:257-68.
3. Simonsen RJ. Clinical Applications of the Acid Etch Technique. Chicago: Quintessence Publishing (IL); 1978.
4. Lesser D. An overview of dental sealants. J Public Health Dent 2001;91/7:1-8.
5. L.W. Ripa. Sealants Revisited: An Update of the Effectiveness of Pit and Fissure Sealants. Caries Research 1993;27:77-82.
6. Simonsen RJ. Pit and fissure sealant: Review of the literature. Pediatr Dent 2002;24:393-414.
7. Lussi A. Validity of diagnostic and treatment decisions of fissure caries. Caries Res 1991;25:296-303.
8. Boksman L, Gratton DR, McCutcheon E, Plotzke OB. Clinical evaluation of a glass ionomer cement as a fissure sealant. Quintessence Int 1987;18:707-9.
9. Sreedevi A, Brizuela M, Mohamed S. Pit and Fissure Sealants. [Updated 2020 Oct 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK448116/
10. Gillet D, Nancy J, Dupuis V, Dorignac G. Microleakage and penetration depth of three types of materials in fissure sealant: Self-etching primer vs etching: An *in vitro* study. J Clin Pediatr Dent 2002;26:175-8.
11. Naaman R, El-Housseiny AA, Alamoudi N. The Use of Pit and Fissure Sealants-A Literature Review. Dent J (Basel). 2017 Dec 11;5(4):34.
12. Dean J.A. *McDonald and Avery's Dentistry for the Child and Adolescent.* 10th ed. Elsevier Health Sciences; Amsterdam, The Netherlands: 2016.
13. Ozer F., Blatz M.B. Self-etch and etch-and-rinse adhesive systems in clinical dentistry. *Compend. Contin. Educ. Dent.* 2013;34:12–14.
14. Sofan E., Sofan A., Palaia G., Tenore G., Romeo U., Migliau G. Classification review of dental adhesive systems: From the IV generation to the universal type. *Ann. Stomatol.* 2017;8:1–17.
15. Casamassimo P.S., Henry W., Fields J., McTigue D.J., Nowak A. *Pediatric Dentistry Infancy through Adolescence.* 5th ed. Elsevier; Amsterdam, The Netherlands: 2013
16. Bandi M, Mallineni SK, Nuvvula S. Retention and effectiveness of pit and fissure sealants placed with or without bonding agent in young permanent teeth: A randomized clinical trial with a year follow-up. Indian J Dent Res. 2020;31:877-82.
17. Hegde RJ, Coutinho RC. Comparison of different methods of cleaning and preparing occlusal fissure surface before placement of pit and fissure sealants: An *in vivo* study. J Indian Soc Pedod Prev Dent. 2016;34:111-4.
18. Singh C, Kaur K ,Kapoor K. Retention of pit and fissure sealant versus flowable composite: An *in vivo* one-year comparative evaluation. J Indian Soc Pedod Prev Dent. 2019;37:372-7.
19. Kumar G, Dhillon JK, Rehman F. A comparative evaluation of retention of pit and fissure sealants placed with conventional acid etching and Er,Cr:YSGG laser etching: A randomised controlled trial. Laser Ther. 2016 Dec 30;25(4):291-298.
20. Kumaran P. Clinical evaluation of the retention of different pit and fissure sealants: a 1-year study. Int J Clin Pediatr Dent. 2013 Sep;6(3):183-7.
21. Cvikl B, Moritz A, Bekes K. Pit and Fissure Sealants-A Comprehensive Review. Dent J (Basel). 2018 Jun 12;6(2):18.
22. Jaafar N, Ragab H, Abedrahman A, Osman E. Performance of fissure sealants on fully erupted permanent molars with incipient carious lesions: A glass-ionomer-based versus a resin-based sealant. J Dent Res Dent Clin Dent Prospects. 2020 Winter;14(1):61-67.
23. Godhane A, Ukey A, Tote JV, Das G, Naphde M, Patil P.Use of Pit and Fissure Sealant in Prevention of Dental Caries in Pediatric Dentistry and Recent Advancement: A Review. Int J Dent Med Res 2015;1(6):220-223.
24. Nagano T. The form of pit and fissures and primary lesions of caries. Dent Abstr 1961.
25. Gwinnett AJ, Buonocore MG. Adhesives and caries prevention; a preliminary report. Br Dent J 1965119:77-80.

26. Heller KE, REED SG, Bruner FW, et al. Longitudinak of sealing molar with and without incipient dental caries in public health program, J Public Health Dent. 1995;55;148- 153