ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of DEVELOPMENT RESEARCH

International Journal of Development Research
Vol. 07, Issue, 06, pp.13345-13348, June, 2017

RESEARCH ARTICLE

PIT AND FISSURE SEALANTS *AN EFFECTIVE METHOD FOR CARIES PREVENTION*

***Harpreet Kaur**

General Dental Practitioner at Smile Architects Multi-Speciality Dental Care Centre, Amritsar, Punjab, India

ARTICLE INFO

Article History:

Received 04th March, 2017
Received in revised form
29th April, 2017
Accepted 15th May, 2017
Published online 30th June, 2017

Key Words:

Pit and fissure caries,
Pit and fissure Sealants,
Caries Prevention.

ABSTRACT

Caries in the pit and fissures of occlusal surfaces of primary and permanent dentition is a significant dental health problem. Since pit and fissures lead to the retention of food on the occlusal surfaces of teeth which in turn cause dental caries. Dental sealants are cost effective treatment modalities when placed on teeth of children at high risk for dental caries. The cariostatic properties of sealants are attributed to the physical obstruction of the pits and fissures. Sealants are still underused despite their documented efficacy and the availability of clinical practice guidelines. If the proper recommendations are followed, sealants would be very beneficial in reducing the dental caries at an early stage.

INTRODUCTION

Dental caries is an infectious microbiologic disease of the teeth that results in localized dissolution and destruction of calcified tissues. Dental caries is considered to be a major dental problem and should receive considerable priority in everyday dental practice, not only from the standpoint of restorative procedures but also as a preventive measure to reduce the prevalence of dental caries. Caries in the pit and fissures of occlusal surfaces of primary and permanent dentition is a significant dental health problem. Since pit and fissures lead to the retention of food on the occlusal surfaces of teeth which in turn cause dental caries. Although fluorides help in reducing the risk of dental caries but the these fluorides either systemic or topical are only effective in reducing the smooth surface caries but not very effective in preventing the pit and fissure caries due to the differences in the enamel thickness or inaccessibility of the base of pits and fissures to topical fluorides. So, sealants are placed to prevent the initiation and arrest the progression by providing physical obstruction that inhibits the cariogenic bacteria and food particles from collecting in pits and fissures. Pit and fissure sealants are used by the public health service but neither national nor general sealant protocols have been published. The main principle underlying the use of sealant is that the prevention is better than treatment.

Corresponding author: Harpreet Kaur,
General Dental Practitioner at Smile Architects Multi-Speciality Dental Care Centre, Amritsar, Punjab, India.

Sound, non-cavitated teeth even though sealed are more valuable than properly restored teeth. Applying sealants before the orthodontic treatment also helps in preventing the caries. It is believed that the application of resin sealants on the enamel surface surrounding the bracket, which should protect the enamel surface from acid attack, is a method of preventing enamel demineralization.

Epidemiology and Efficacy

"In data from 2004, 42 percent of children and young adults aged 6 to 19 years had dental caries (decayed or filled) in their permanent teeth. Prevalence of dental caries increases with age, ranging from 21 percent among those aged 6 to 11 years to 67 percent among adolescents aged 16 to 19 years. The prevalence of dental caries is higher among children from low income families and those of Mexican-American ethnicity. Overall, about one quarter of carious surfaces remain untreated in children and young adults with any caries. About 90 percent of carious lesions are found in the pits and fissures of permanent posterior teeth. These data also include that around 40 percent of children aged 2 to 8 years have experienced dental caries (decayed or filled) in their primary teeth. Similar to the findings for the permanent teeth, the prevalence of dental caries of untreated decay in the primary teeth is higher among children from low income families and those of Mexican-American ethnicity. Overall, about one half of carious surfaces remain untreated among children with any caries.

About 44 percent of carious lesions in primary teeth are found on the pits and fissures of molars "(www.cdc.gov/nchs/nhanes.htm. (Mar 2, 2017). The occlusal surfaces account for up to 90% of all caries in school aged children (Kaste *et al*., 1991). Dental sealants are a means to prevent caries by painting thin resin coatings on the pits and fissures of the occlusal tooth surfaces. In one study, it has been found that pit and fissure sealants have reduced caries over 70%. (Llodra *et al*., 1993). Pits and fissures of the permanent molars are vulnerable sites for caries lesions due to morphology and plaque accumulation. Sealants applied to pit and fissures act as mechanical barriers between enamel surface and the biofilm, and if retained completely, have been shown to be very effective in restricting the growth of bacteria. "The studies of Handelman from over 30 years ago and some later studies by Mertz-Fairhurst *et al*. have shown that when caries lesions are sealed, the lesion does not progress. Although there has been a decline in prevalence of caries in adolescents and children in particular, the decrease in occlusal surface caries has not kept pace with the decrease in the smooth surface caries.

Although this overall decline has been attributed to preventive interventions such as water fluoridation, fluoride toothpaste, fluoride varnishes, and sealants, topical fluoride applications-such as fluoride varnishes- may have a greater effect reducing carious lesions on smooth surfaces compared with caries in pit and fissures" (Handelman *et al*., 1187). "NHANES 2011-2012 show that 41% of children aged 9 to 11 years and 43% of adolescents aged 12 to 19 years had atleast 1 dental sealant. Non-Hispanic black children had the lowest dental sealant prevalence in both age groups compared with Hispanic, Non-Hispanic white and Asian children" (http://www.cdc.gov/nchs/products/ databriefs/db191.htm). Therefore underutilization of sealants is of key concern. One study showed that Ultraseal XT Plus sealant provides significant protection against the formation of white spot lesions during fixed orthodontic treatment (Adam, 2009). Sealed teeth were almost four times less likely to form white spots than were control teeth. Moreover, white spot lesions on the sealed teeth were smaller and less severe than those on the control teeth.

Indications

Sealants should be placed on all permanent molar teeth without cavitation i.e. permanent molar teeth that are free of caries, permanent molar teeth that have deep pit and fissure morphology, permanent molar teeth with sticky fissures, or permanent molar teeth with stained grooves as soon after eruption as isolation can be achieved. Sealants should not be placed on partially erupted teeth or teeth with cavitation or caries of the dentin. Sealants should be placed on the primary molars of children who are susceptible to caries. (i.e. those with a history of caries. Sealants should be placed on first and second permanent molar teeth within 4 years after eruption.

Classification of pit and fissure sealants

Based on filler content

Sealants are classified into filled and unfilled resin systems in regard to the presence or absence of filler particles in the system, but most of the self-cured resins are unfilled. The filled sealants contain microscopic glass beads, quartz particles, and other fillers used in composites resins. The fillers make the resin more resistant to abrasion and wear.

Based on the color of the sealants

Sealants are of two types i.e. colored or colorless. Tinted and opaque fissure sealants have the advantage of more accurate evaluation by the dentist at recall.

Sealants are also classified as

First Generation sealant

The first sealant material that utilized the acid etch technique was introduced in the mid 1960's and was a cyanoacrylate (CA) substance. Later on, these CA's were replaced by second generation sealants which were found to be resistant to degradation and produced a tenacious bond with etched enamel.

Second Generation sealants

The second generation sealants are the dimethacrylates, which represent the reaction product of BIS-GMA, which is considered by its originator to be a hybrid between a methacrylate and an epoxy resin. Second generation sealants are auto-polymerizing and set upon mixing with a chemical catalyst-accelerator system. They are generally self-cured or chemically cured without the need of an external ultraviolet source. Second generation sealants provided superior retention and caries protection than the first generation sealants.

Third Generation Sealants

The third generation sealants are photo activated resins which contain a diketone initiator such as Camphoroquinone and a reducing agent such as tertiary amine to initiate polymerization. The evaluation of third generation or visible light activated sealants falls into the present era of clinical testing in which retention, rather than caries inhibition, constitutes the principal criterion of success.

Fourth Generation Sealants

Fluoride the pivot of preventive dentistry continues to be the cornerstone of caries prevention program. Fluoride releasing sealants have shown antibacterial properties as well as greater resistance to artificial caries in comparison to non-fluoridated sealants.

Application technique

It is very important to follow the proper technique of application while applying the sealants on pit and fissures of occlusal surfaces of teeth as the efficacy of these sealants to prevent the initiation or progression of caries depends on the retention of the sealants. So, every step to apply the pit and fissure sealants should be followed properly for the long term retention of sealants.

Cleaning the pit and fissure surfaces

Prior to the application of an etchant and sealant, the tooth surface should be cleaned of any debris and plaque otherwise this might interfere with proper retention of sealant on the tooth surface. The sealant will be retentive on the tooth surface if the tooth surface is properly cleaned before the application of sealant regardless of the method for cleaning used. It is generally recommended to treat each quadrant separately, to use four-handed technique with an assistant, and to follow the manufacturer's recommendations.

Cleaning the tooth surface permits the maximum contact of the etch and the sealant with the enamel surface. Use of prophy pastes, especially those with fluoride, have been discouraged because it was thought that the fluoride might make the enamel surface less reactive to the etchant and thereby reduce the bond strength.

Isolation of tooth

Adequate isolation during the sealant application is the most critical step. Salivary contamination of a tooth surface during or after acid etching will have a deleterious effect on the ultimate bond between enamel and resin. Rubber dam or cotton rolls provide equal isolation if used properly.

Etching

After isolating the tooth surface properly, the tooth surface is etched with an acid usually with an orthophosphoric acid liquid gel. Clinical studies indicate that a 15 second etch is adequate for sealant retention and no additional benefit received from longer etching times of 45 or 60 seconds.

Rinsing and Drying the tooth

An exact rinsing time is not as important but the rinsing time should be long enough to remove all the etchant. Many of the sealant manufacturers recommend rinsing the tooth for 20-30 s to remove the etchant.

Sealant application

After drying the tooth surface properly, all the susceptible pits and fissures should be sealed. Any bubbles if incorporated in the material during sealant application, it should be removed before polymerization. All areas should be covered without overfilling to minimize occlusal adjustments. After placement, the material is left in place for 10 seconds prior to curing to allow optimum penetration into the pores. Curing time is usually 20-30 seconds, depending on the manufacturer. Longer curing time is related to increased retention.

Evaluation

After the placement of sealant, the occlusion should be evaluated and corrected as required.

Sealant Maintenance

The sealant should be re-examined every six months for defects.

DISCUSSION

Sealants are still underused despite their documented efficacy and the availability of clinical practice guidelines. Although the sealants have been used widely in dental practice by some dental professionals but there is still need to follow a uniform criteria and guidelines to apply the pit and fissure sealants to provide the best benefit to the patients. Studies have shown that some patients do not come for regular follow up after the placement of pit-and-fissure sealants which makes the dentists unable to reevaluate the proper placement of pit and fissure sealants and patients who dislodge them partially or fully do not get the benefit of these sealants in reducing the dental caries.

Conclusion

The cariostatic properties of sealants are attributed to the physical obstruction of the pits and fissures. This prevents the penetration of fermentable carbohydrates and so the remaining bacteria cannot produce acid in cariogenic concentrations. Dental sealants are cost effective treatment modalities when placed on teeth of children at high risk for dental caries. Educating parents and patients on the importance of dental sealants is critical. Parents are often unaware of the existence of dental sealants. Parents need to be informed about dental sealant before they can make an educated choice for their children. The fact that pits and fissures are safe and effective should justify their routine use as a preventive measure. The evidence-based recommendations are a resource to be considered in the clinical decision-making process which also includes the practioner's professional judgement and the patient's needs and preferences. Pit and fissure sealants can be used effectively as part of a comprehensive approach to caries prevention. While sealants have been used for primary caries prevention, current evidence that sealants also are an effective secondary preventive approach when placed on early non-cavitated carious lesions. Caries risk assessment is an important component in the decision-making process, and it is important to reevaluate a patient's caries risk status periodically. Caries is a problem for patients of all ages. Along with proper diet, fluoride, and biofilm control, pit and fissure sealants should be considered as part of an overall preventive program rather than an isolated procedure. Meticulous care should be used when placing sealants, especially limiting saliva contamination and using a four-handed technique with an assistant. The dental practitioner should be familiar with the various categories of sealants and the specific application methods for each product. With proper placement and maintenance, sealants can last years.

REFERENCES

"National Center for Health Statistics, Centers for Disease Control and Prevention. National Health and Nutrition Examination Surveys 1999-2004." Available: www.cdc.gov/nchs/nhanes.htm. (Mar 2, 2017).

Adam, W., Benhama, Phillip, M., Campbell, Peter, H., Buschang, 2009. "Effectiveness of Pit and Fissure Sealants in Reducing White Spot Lesions during Orthodontic Treatment." *Angle Orthodontist,* Vol 79(2), DOI: 10.2319/022808-30.1

Amir Azarpazhooh, Patricia, A. Main. 2008. "Pit and Fissure Sealants in the Prevention of Dental Caries in Children and Adolescents: A Systematic Review." *JCDA*, vol. 74(2). Available: www.cda-adc.ca/jcda

Dye, B.A., Thornton-Evans, G., Li, X., Iafolla, T.J. "Dental caries and sealant prevalence in children and adolescents in the United States, 2011–2012." Available: http://www.cdc.gov/nchs/products/databriefs/db191.htm. (Mar 9, 2017).

George Babu, Shanthala Mallikarjun, Bobby Wilson, Chandru Premkumar. "Pit and fissure sealants in Pediatric Dentistry." *SRM Journal of Research in Dental Sciences*, vol. 5(4), pp"253-257, 2014

Handelman, S.L., Buonocore, M.G., Schoute, P.C. "Progress Report on the effect of a fissure sealant on bacteria in dental caries." *JAM Dent Assoc*, vol.87, pp: 1187-1191, 1973.

Heidi Emmerling Munoz, and Jan Carver Silva. "Pit and Fissure sealants: An Overview." RDH, pp: 96-98,2013.

Jean Beauchamp, Page, W., Caufield, *et al*. 2008. "Evidence-based clinical recommendations for the use of pit-and-fissure sealants." *JADA*, vol.139. Available: http://jada.ada.org

John, T., Wright, James J., Crall, *et.al.* (2016). "Evidence-based clinical practice guideline for the use of pit-and-fissure sealants." *JADA* vol. 147(8). Available: http://jada.ada.org

Kaste, L.M., Selwitz, R.H., Oldakowski, R.J., Brunelle, J.A., Winn, D.M., Brown, L.J. "Coronal caries in the primary and permanent dentition of children and adolescents 1-17 years of age: United States, 1988-1991." *J Dent Res*, Vol.75, pp: 631-641, 1996

Llodra, J.C., Bravo, M., Delgado-Rodriguez, M., Baca. P., Galvey, R. "Factors influencing the effectiveness of sealants-a meta-analysis." *Community Dent Oral Epidemiol*, Vol. 21(5), 1993.

Locker, D., Jokovic, A., Series Editor, E. J., Kay. "Prevention Part 8: The use of pit and fissure sealants in preventing caries in the permanent dentition of children." *British Dental Journal*, vol. 195(7), 2003.

Sari Kervanto-Seppälä, Ilpo Pietilä, Jukka H Meurman, and Eero Kerosuo. (2009). "Pit and fissure sealants in dental public health – application criteria and general policy in Finland." *BMC Oral Health*,vol. 9(5). Available: http://www.biomedcentral.com/1472-6831/9/5

Shobha Tandon. Textbook Of Pedodontics. 2008, pp: 257-264.

Soben Peter. *Preventive and Community Dentistry*. 2009, pp: 440-446.

****