Evidence-based clinical practice guideline for the use of pit-and-fissure sealants

A report of the American Dental Association and the American Academy of Pediatric Dentistry

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ABSTRACT

Background. This article presents evidence-based clinical recommendations for the use of pit-and-fissure sealants on the occlusal surfaces of primary and permanent molars in children and adolescents. A guideline panel convened by the American Dental Association (ADA) Council on Scientific Affairs and the American Academy of Pediatric Dentistry conducted a systematic review and formulated recommendations to address clinical questions in relation to the efficacy, retention, and potential side effects of sealants to prevent dental caries; their efficacy compared with fluoride varnishes; and a head-to-head comparison of the different types of sealant material used to prevent caries on pits and fissures of occlusal surfaces.

Types of Studies Reviewed. This is an update of the ADA 2008 recommendations on the use of pit-and-fissure sealants on the occlusal surfaces of primary and permanent molars. The authors conducted a systematic search in MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and other sources to identify randomized controlled trials reporting on the effect of sealants (available on the US market) when applied to the occlusal surfaces of primary and permanent molars. The authors used the Grading of Recommendations Assessment, Development, and Evaluation approach to assess the quality of the evidence and to move from the evidence to the decisions.

Results. The guideline panel formulated 3 main recommendations. They concluded that sealants are effective in preventing and arresting pit-and-fissure occlusal carious lesions of primary and permanent molars in children and adolescents compared with the nonuse of sealants or use of fluoride varnishes. They also concluded that sealants could minimize the progression of noncavitated occlusal carious lesions (also referred to as initial lesions) that receive a sealant. Finally, based on the available limited evidence, the panel was unable to provide specific recommendations on the relative merits of 1 type of sealant material over the others.

Conclusions and Practical Implications. These recommendations are designed to inform practitioners during the clinical decision-making process in relation to the prevention of occlusal carious lesions in children and adolescents. Clinicians are encouraged to discuss the information in this guideline with patients or the parents of patients. The authors recommend that clinicians reorient their efforts toward increasing the use of sealants on the occlusal surfaces of primary and permanent molars in children and adolescents.

Key Words. Pit-and-fissure sealants; clinical recommendations; guideline; occlusal caries; caries prevention; caries arresting.

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Pit-and-fissure sealants have been used for nearly 5 decades to prevent and control carious lesions on primary and permanent teeth. Sealants are still underused despite their documented efficacy and the availability of clinical practice guidelines.[1,2] New sealant materials and techniques continue

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to emerge for managing pit-and-fissure caries, further complicating the clinician's decision making. Accordingly, continuous critical review of the available evidence is necessary to update evidence-based recommendations and assist health care providers in clinical decision making.[1-7]

The American Dental Association (ADA) Council on Scientific Affairs convened an expert panel to develop the previous evidence-based clinical recommendations for the use of sealants, published in 2008.[3] In an effort to update the 2008 recommendations, the ADA Council on Scientific Affairs and the ADA Center for Evidence-Based Dentistry, in collaboration with the American Academy of Pediatric Dentistry (AAPD), convened a new working group including clinical experts, stakeholders, and methodologists to develop a systematic review[8] and accompanying evidence-based clinical practice recommendations for publication in 2016.

Our goal for this 2016 clinical practice guideline was to provide clinicians with updated evidence-based recommendations regarding when and how the placement of pit-and-fissure sealants is most likely to be effective in preventing carious lesions on the occlusal surfaces of primary and permanent teeth in children and adolescents. The target audience for this guideline includes general and pediatric dental practitioners and their support teams, public health dentists, dental hygienists, pediatricians, primary-care physicians, and community dental health coordinators; policy makers may also benefit from this guideline to inform clinical decision making, programmatic decisions, and public health policy.

DEFINITION OF DENTAL CARIES

Dental caries is a disease caused by an ecological shift in the composition and activity of the bacterial biofilm when exposed over time to fermentable carbohydrates, leading to a break in the balance between demineralization and remineralization.[4] Carious lesions are preventable by averting onset, and manageable by implementing interventions, which may halt progression from early stage of the disease to cavitation, characterized by enamel demineralization, to frank cavitation.[3] In 2015, the ADA published the Caries Classification System, which defines a noncavitated or initial lesion as "initial caries lesion development, before cavitation occurs. Noncavitated lesions are characterized by a change in color, glossiness or surface structure as a result of demineralization before there is macroscopic breakdown in surface tooth structure."[4]

EPIDEMIOLOGY

National Health and Nutrition Examination Survey (NHANES) 2011-2012[5] data show that 21% of children aged 6 to 11 years and 58% of adolescents aged 12 to 19 years had experienced carious lesions (untreated and treated [restored]) in their permanent teeth.

The NHANES report also found the prevalence of carious lesions in permanent teeth increased with age and differed among sociodemographic groups. Children in the 9- to 11-year range had higher carious lesion prevalence (29%) compared with children in the 6- to 8-year range (14%). Similarly, children in the 16- to 19-year age range had higher carious lesion prevalence (67%) compared with children in the 12- to 15-year range (50%). In addition, dental caries incidence for both 6- to 11-year and 12- to 19-year age groups was highest among Hispanic children compared with non-Hispanic black children, non-Hispanic white children, and Asian children. The surgeon general's report on oral health similarly indicated that Hispanic and non-Hispanic black children are at the highest risk of developing dental caries.[6] Overall, NHANES 2011-2012 indicates a higher prevalence of untreated carious lesions in the 12- to 19-year age group (15%) compared with the 6- to 11-year age group (6%).[5]

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.[7] 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 pits and fissures.[1-7,9,10]

NHANES 2011-2012 data show that 41% of children aged 9 to 11 years and 43% of adolescents aged 12 to 19 years had at least 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.[5] Therefore, underutilization of sealants is of key concern.

POTENTIAL ROLE OF PIT-AND-FISSURE SEALANTS IN PRIMARY AND SECONDARY PREVENTION

From a primary prevention perspective, anatomic grooves or pits and fissures on occlusal surfaces of permanent molars trap food debris and promote the presence of bacterial biofilm, thereby increasing the risk of developing carious lesions. Effectively penetrating and sealing these surfaces with a dental material—for example, pit-and-fissure sealants—can prevent lesions and is part of a comprehensive caries management approach.[11]

From a secondary prevention perspective, there is evidence that sealants also can inhibit the progression

ABBREVIATION KEY. **AAPD:** American Academy of Pediatric Dentistry. **ADA:** American Dental Association. **BPA:** Bisphenol A. **GI:** Glass ionomer. **GRADE:** Grading of Recommendations Assessment, Development and Evaluation. **NHANES:** National Health and Nutrition Examination Survey.

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