Cover Story

Evidence-based clinical practice guideline on nonrestorative treatments for carious lesions

A report from the American Dental Association

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ABSTRACT

Background. An expert panel convened by the American Dental Association Council on Scientific Affairs and the Center for Evidence-Based Dentistry conducted a systematic review and formulated evidence-based clinical recommendations for the arrest or reversal of noncavitated and cavitated dental caries using nonrestorative treatments in children and adults.

Types of Studies Reviewed. The authors conducted a systematic search of the literature in MEDLINE and Embase via Ovid, Cochrane CENTRAL, and Cochrane database of systematic reviews to identify randomized controlled trials reporting on nonrestorative treatments for noncavitated and cavitated carious lesions. The authors used the Grading of Recommendations Assessment, Development and Evaluation approach to assess the certainty in the evidence and move from the evidence to the decisions.

Results. The expert panel formulated 11 clinical recommendations, each specific to lesion type, tooth surface, and dentition. Of the most effective interventions, the panel provided recommendations for the use of 38% silver diamine fluoride, sealants, 5% sodium fluoride varnish, 1.23% acidulated phosphate fluoride gel, and 5,000 parts per million fluoride (1.1% sodium fluoride) toothpaste or gel, among others. The panel also provided a recommendation against the use of 10% casein phosphopeptide—amorphous calcium phosphate.

Conclusions and Practical Implications. Although the recommended interventions are often used for caries prevention, or in conjunction with restorative treatment options, these approaches have shown to be effective in arresting or reversing carious lesions. Clinicians are encouraged to prioritize use of these interventions based on effectiveness, safety, and feasibility.

Key Words. Carious lesion; American Dental Association; practice guidelines; evidence-based dentistry; decision making; general practice; clinical recommendations; nonrestorative treatments; caries.

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Dental caries is a chronic noncommunicable disease that affects people of all ages worldwide. From 2015 through 2016, approximately 4 of 10 young children[1] and from 2011 through 2012 9 of 10 adults[2] were affected by caries in the United States. Although in the past decade overall caries prevalence has stabilized in both children and adults, these rates remain at a constant high for specific subgroups. According to the 2011-2012 National Health and Nutrition Examination Survey, non-Hispanic white adults aged 20 through 64 years have the highest caries prevalence rates (94%) compared with those of Hispanic, non-Hispanic black, and non-Hispanic Asian adults.[2] The 2015-2016 National Health and Nutrition Examination Survey data show

that Hispanic youth aged 2 through 19 years also have the highest prevalence rate (52%) compared with non-Hispanic black, non-Hispanic Asian, and non-Hispanic white youth.[1] In addition, there are income-related disparities in caries prevalence in which low-income groups have a higher prevalence of untreated caries than do high-income groups.[1] Worldwide, the direct costs of treatment because of dental disease were estimated to be approximately $298 billion yearly in 2010, with $120 billion attributed to the United States alone.[3]

Caries is caused by frequent acid production from the metabolism of dietary carbohydrates. This mechanism results in the emergence of acid-producing and acid-tolerant organisms in supragingival oral biofilms, altered pH, shift in the demineralization-remineralization equilibrium, and loss of tooth minerals. When there is a balance between protective factors (for example, fluoride, calcium, phosphate, adequate salivary flow, composition) and pathologic factors (for example, cariogenic bacteria, fermentable carbohydrates), demineralization and remineralization of enamel are relatively equal, and oral health is maintained.[4-6]

Preventing the onset of caries across the life span should be the primary goal of a caries management plan. However, once the disease is present, clinicians deal with the challenge of determining the appropriate approach to stop the consequences of the cariogenic process, which can be achieved by applying interventions at the patient level and managing the manifestation of the disease at the lesion level. Patient-level interventions aim to reestablish the mineralization balance. These interventions usually require adequate patient adherence for success and include, but are not limited to, diet counseling (for example, reducing sugar consumption[7]) and oral hygiene instructions and reinforcement[8] (for example, interdental cleaning, toothbrushing with fluoridated toothpaste). Patient-level interventions will be discussed further in a subsequent American Dental Association (ADA) guideline for caries prevention. Lesion-level interventions include nonrestorative or nonsurgical (noninvasive and microinvasive) and restorative or minimally-invasive and invasive treatments. The former are more conservative approaches that stops the disease process through arrest or reversal of carious lesions and minimizes the loss of tooth structure.

Noncavitated carious lesions can be described as surfaces that appear macroscopically intact and without clinical evidence of cavitation.[9] They sometimes are referred to as incipient, initial, early, or white-spot lesions (although these lesions can be white or brown).[10] A cavitated lesion is a carious lesion with a surface that is not macroscopically intact and with a distinct discontinuity or break in the surface integrity, usually determined using visual or tactile means.[9,10] Noncavitated lesions have the potential to reverse by means of chemical interventions or arrest by means of chemical or mechanical interventions. Cavitated lesions are less likely to reverse or arrest without these interventions.

The purpose of this clinical practice guideline is to help clinicians decide which types of nonrestorative treatments or interventions could be used to arrest or reverse existing noncavitated and cavitated carious lesions in adults and children. The target audience for this guideline includes general and pediatric dental practitioners and their support teams, public health dentists, dental hygienists, and community oral health coordinators. Policy makers may also benefit from using this guideline.

This guideline and associated systematic review (O. Urquhart, MPH, written communication, August 2018) are products of an expert panel composed of general, public health, and pediatric dentists and cariologists convened by the ADA Council on Scientific Affairs. Methodological support, stakeholder engagement, and drafting of this clinical practice guideline and its associated systematic review were led by the ADA Center for Evidence-Based Dentistry.

ABBREVIATION KEY

ACP: Amorphous calcium phosphate.
ADA: American Dental Association.
APF: Acidulated phosphate fluoride.
CPP: Casein phosphopeptide.
ICDAS: International Caries Detection and Assessment System.
NaF: Sodium fluoride.
NIDCR: National Institute of Dental and Craniofacial Research.
NIH: National Institutes of Health.
RCT: Randomized controlled trial.
SDF: Silver diamine fluoride.

METHODS

We adhered to the Appraisal of Guidelines for Research and Evaluation Reporting Checklist II[11] and Guidelines International Network—McMaster Guideline Development Checklist[12] when developing this guideline and preparing this manuscript. The panelists first met in person to define the scope, purpose, clinical questions, and target audience. Methodologists at the ADA Center for Evidence-Based Dentistry then conducted a systematic review and network meta-analysis of the literature to address the clinical questions (O. Urquhart, MPH, unpublished data, August 2018). At second and third in-person meetings in October 2017 and February 2018 respectively, the panel formulated recommendation statements by using the Grading of Recommendations Assessment, Development and Evaluation evidence to decision framework, facilitated by methodologists at the ADA Center for Evidence-Based Dentistry (O.U., M.P.T., A.C.-L.).[13] This framework involves consideration of a minimum of 4 factors: balance between benefits and harms,