Early Carious Lesions - Treatment Considerations

Position Statement

Introduction

“Traditional restorative dental treatment has many shortcomings and has not been shown to be an effective method for managing caries. In spite of this, many dentists continue to be powered by an aggressive restorative approach which may result in unnecessary treatment and which must now be seen as inappropriate. There is a pressing need for a greater understanding as to the precise criteria that dictate the need for both non-invasive (reversible) preventive measures and invasive (irreversible) restorative treatment.”

“Traditionally, dental caries has been managed simply by detecting cavities or precavitated lesions followed by drilling and filling. In recent years, a better understanding of the caries process has changed this operative treatment philosophy: preventive strategies involving fluoride and re-mineralization are preferred, and operative treatments are undesirable unless the carious lesion has reached cavitation.”

Methods

Using MEDLINE, articles were selected to review possible treatment for early carious lesions. The papers fit AADC criteria for sample size and duration to determine the need for, success of, or failure in treatment of early carious lesions. The papers selected for review in this literature each were aggregate studies evaluating large sample size.

Discussion

“Very many pits show evidence of some slight softening in early youth, which is stopped by the coming of immunity or some change of local conditions. These become dark in color and so remain without further change. These should not be interfered with, as they are just as safe without any filling whatever.”

The above was written in 1908 by G. V. Black.

There are no established standards in the diagnosis of carious lesions. Early or incipient lesions are particularly difficult to diagnose due to the subjective nature of lesion determination. Further, there are no standards for the treatment of early or incipient carious lesions. This creates a dilemma for clinicians. There is a fear that if lesions are not treated early, progression can lead to more tooth damage requiring more extensive treatment. However, studies have demonstrated that early surgical intervention in comparison with non-surgical techniques, including re-calcification, results in unnecessary loss of tooth structure.

The AADC Positions Committee has investigated evidence-based literature to establish the position of the AADC regarding the restoration of early or incipient lesions.

The central focus of this AADC position paper is the efficacy of non-surgical management of early carious lesions based on current best evidence. The position committee wishes to make it clear that this position paper is not intended to investigate or establish a position regarding the diagnosis of carious lesions. While there is existing research that attempts to classify carious lesions along a continuum from early enamel lesions to extensive cavitated lesions, the committee is of the opinion that there is no current consensus on established criteria for diagnosis or diagnostic codes and the use of diagnostic codes for caries are not generally used in private practice settings. The diagnosis of caries as well as the extent of a lesion remains subjective. As such, the committee’s position regarding current best evidence for the nonsurgical management of early carious lesions starts with an assumption that there is a consensus that the lesions are early lesions.

The management of carious lesions, even early lesions, has traditionally involved the surgical model, ie, a restoration. The old theory of “extension for prevention” actually encouraged the removal of healthy enamel and dentin, replacing it with amalgam or composite. With increased knowledge of the cause of caries, there has been increasing evidence in support of a “medical model” that includes treating non-cavitated early lesions non-surgically, thus preserving tooth structure. The new paradigm encourages treating the disease and not merely the destruction caused by the disease. The position committee conducted a literature search of the current best evidence to determine the efficacy of non-surgical management of early carious lesions.

The rationale for the AADC to take a position regarding the management of early lesions is embodied in a recent New York Times article (November 28, 2011) entitled “A Closer Look at Teeth May Mean More Fillings” by Ritchie S. King. The article states as follows:

“With increasingly sophisticated detection technology, dentists are finding — and treating — tooth abnormalities that may or may not develop into cavities. While some describe their efforts as a proactive strategy to protect patients from harm, critics say the procedures are unnecessary and painful, and are driving up the costs of care.” In the article, Jim Bader, DDS, MPH,( research
professor, Department of Operative Dentistry, School of Dentistry, and a senior research fellow, Cecil G. Sheps Center for Health Services Research, University of North Carolina, Chapel Hill), states: “Many experts think it doesn’t make sense to operate in the early stages of decay. If you don’t have any kind of demonstrable collapse of the enamel wall, then you shouldn’t put in a filling”.

The committee found it interesting that even a cursory search of the literature uncovered no less than 15 peer reviewed articles on the subject. The vast majority of the studies demonstrated the efficacy of re-mineralization of early carious lesions using various methods, materials, and techniques. A synopsis of the research follows.

One of the most time honored and traditional methods of caries prevention is fluoride. The dental profession has always embraced the ability of fluoride to harden enamel making it less susceptible to destruction by acid producing bacteria. Further, fluoride has also been shown to be effective in re-mineralization of both enamel and dentin affected by bacteria producing acids.

Fluoride regimens on enamel re-mineralization “…indicated fluoridated rinse to have significantly greater re-mineralization effects on adjacent caries than the other groups…”4 “The glass ionomer restorative material and fluoridated dentifrice also had significantly greater re-mineralization effects on adjacent caries than the control, yet significantly less than the fluoridated rinse…”4

“This present case report shows that fluoride varnish may be a good addition to preventive therapy for arresting caries in adult patients in general practice. Surgical intervention may be avoided in patients whose risk has shifted to a lower level.”5

Another community-based study conducted in schools concluded

“These results suggest that biannual APF gel application is an effective preventive measure in reversing incipient carious lesions.”

(APF is Acidulated Phosphate Fluoride Gel)

Non-fluoride compounds have also been shown to be as effective, if not more effective, than fluoride. Research has demonstrated the use casein phosphopeptide, or CPP, to remineralize tooth surfaces to be effective.

“The CPP [Casein phosphopeptide], by stabilizing calcium phosphate in solution, maintain high-concentration gradients of calcium and phosphate ions and ion pairs into the subsurface lesion and thus effect high rates of enamel remineralization.”7

“Results demonstrate that CPP’s are able to promote re-mineralization of early enamel lesions.”8

Re-mineralization has also been demonstrated to be effective for deciduous teeth.

“It is concluded that it is possible to re-mineralize initial carious lesions in deciduous enamel in a similar way as it has been described for enamel of permanent teeth.”9

Re-mineralization of early interproximal lesions has been shown to be effective as well.

“The quantitative light-induced fluorescence showed a significant remineralizing effect after the fluoride treatment…compared to the placebo treatment…”10

Another non-invasive method to treat early lesions as well as help prevent lesions is the use of sealants. Sealants have been well recognized and accepted as a preventive measure in children. Further, research has also demonstrated the ability of sealants to treat early proximal enamel lesions.

“The results show the potential of sealants to act as a noninvasive treatment of early proximal enamel lesions.”11

A systematic review investigating emerging methodologies that might be used in the prevention of and/or the repair of carious tissues (enamel and dentin) was conducted at the University of Michigan School of Dentistry by Dr. Brian Clarkson, Chair Department of Cariology, Restorative Sciences, and Endodontics and Dr. Rafter, Associate Clinical Professor. The review included 33 research articles that met inclusion criteria out of 200 articles. The reviewers investigated four emerging methods: partitioned dentifrice, laser technology, fluoride releasing restorative materials, and for deep lesions, bone morphogenic protein (BMP). All four methods demonstrated encouraging results.

However, the authors opined that more clinical trials were necessary before these technologies can be recommended for use in general practice.12

Current best evidence supports the ability of fluoride, sealants, and some non-fluoride compounds to reverse through re-calcification the de-mineralization of tooth surfaces. As such, re-mineralization techniques have been shown to be effective in the treatment of early carious lesions. However, the traditional approach of surgical intervention in the treatment of early lesions not only persists, but is prevalent in the United States.
“Until recently, surgical intervention was considered the essential cure for such a lesion, and the profession has been trained to undertake operative procedures immediately. However, it has now been shown clearly that the disease progresses reasonably slowly in the early stages. In fact, it can be controlled or even eliminated before surface cavitation. A lesion is reversible and can be healed up until there is a cavity deep enough to retain bacterial plaque.”

“The profession must become aware of the importance of identifying the early evidence of disease, rather than just seeking cavities. After all, it can take as long as 4 years for a carious lesion to penetrate the enamel and a further 4 years to reach the depths of the dentine.”

A recent study conducted by the Washington Dental Service was designed to see if there was an economic advantage in finding a dental home by the age of one and using interceptive methodology to prevent the necessity to have a first restoration on first molar teeth prior to the age of thirteen. Members of WDS were tracked from age five through age 12 for restorative history on first molars. Restorative costs were tabulated. A second group was tracked from age one through age seven to determine how many first molars were restored and what the interceptive costs were.

Although the study was eventually abandoned early indications were that such a program would be cost effective. With that in mind, AADC concludes that there may be additional rationale for delaying initial restorations until more conservative treatment has failed to arrest or reverse the initial lesion.

**Position Statement**

Given the preponderance of current best evidence, it is the position of the AADC that non-surgical management of early carious lesions through the use of re-calcification techniques has been shown to effectively stop or reverse the caries disease process. Further, evidence supports that such non-surgical treatment is more effective in the preservation of natural tooth tissue and is more cost effective than placing restorations.

**References**


3) Black, G.V., Operative dentistry. Chicago, Medico-Dental Publishing Co., 1908, p. 205


**AADC Positions Committee**

Dr. Michael Weisenfeld (Chair)

Dr. Clay Pesillo (Principal Author)

Dr. D E FitzGerald (Co-Author)

Dr. Cary Sun

Dr. Stephanie Lepsky

Dr. Marc Zweig

Dr. Andrew Mogelof