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Full Length Article

Dentists' decision strategies for suspicious occlusal caries lesions in a National Dental PBRN study

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ABSTRACT

Objective: Case presentations (vignettes) were completed by dentists in the National Dental Practice-Based Research Network study "Decision Aids for the Management of Suspicious Occlusal Caries Lesions (SOCLs)". The objective was to determine dentists' decision strategies for SOCLs.

Methods: 107 dentists viewed a series of 16 vignettes that represented all combinations of 4 clinical cues: color, luster, lesion roughness, and patient-level caries risk. Each vignette included a patient description and a photograph of a tooth presenting the 4 cues. Dentists were asked to decide the likelihood that a suspected lesion extended into dentin. A lens model analysis was used to examine how dentists use these cues in making their decisions.

Results: 86% of dentists had a consistent pattern of cue use that defined their decision strategy. On average, 70% of the variance in their decisions was accounted for by their use of the 4 cues. However, there was considerable variability in the individual cues used by each dentist. The percentages of dentists who used the different cues consistently were: luster (58%), color (48%), roughness (36%), and risk (35%). 14% of dentists reliably used only color, 7% used only luster, 4% used only roughness, and 1% used only risk when making SOCL decisions.

Conclusions: The online vignette system suggests that clinical SOCL decision strategies are highly individualized and dentists do not use all cues available to them to make these decisions.

Clinical significance: Prior to this study, there has been little evidence about how dentists use these cues (either individually or in combination) when judging the extent of caries progression. Such knowledge would be valuable when designing interventions to help dentists maximize the likelihood of appropriate treatment decisions.

1. Introduction

Suspicious occlusal caries lesions (SOCLs) are initial caries lesions on occlusal surfaces of posterior permanent teeth. They often present a diagnostic challenge because it is difficult to determine if the lesion has penetrated into dentin [1–3]. Determining the depth of penetration is critical to providing the appropriate treatment. Non-surgical therapy (fluoride, sealant) is recommended when lesions are confined to enamel and when dentinal lesions are inactive. Surgical treatment is reserved for active lesions that have penetrated into dentin [4,5]. In the event of uncertainty, watchful waiting and/or non-surgical treatment are recommended because the proportion of these lesions that progress is small and progression is seldom rapid [4,6,7]. The treatment selection is important because surgical treatment predisposes for ever-larger restorations in the future [8].

SOCLs are commonly encountered in general dental practice, with

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[1] The National Dental PBRN Collaborative Group includes practitioner, faculty, and staff investigators who contributed to this activity. A list is available at http://nationaldentalpbrn.org/collaborative-group.php.

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approximately one-third of patients exhibiting such a lesion at any given time [9]. Despite the generally acknowledged threshold of limiting surgical treatment to lesions that penetrate dentin [10], many teeth with such lesions are opened unnecessarily: in a large National Dental Practice-Based Research Network ("network") study almost one-half of the lesions that practitioners opened surgically did not penetrate clinically into dentin [11]. While a majority of dentists in the network subscribe to the "restorative threshold" of caries penetrating into dentin, their ability to preoperatively detect when this penetration has occurred is not optimal [12].

By definition, initial caries lesions have not penetrated far enough into the occlusal dentin for its demineralization to be evident radiographically. Therefore, practitioners often rely solely on clinical examination to assess the likelihood of lesion progression into dentin. Diagnosing caries can be thought of as a process that involves three steps: detection, assessment of the severity, and assessment of the activity [13], which will lead to an appropriate treatment plan. Assessment of severity and activity can be established by cues such as color, feel, and luster of the lesion [14], as well as caries risk of the patient. Makhija et al. studied 2603 SOCL in 82 practices [9]. Their findings showed that a majority of the lesions were on molars (69%), about ½ were chalky (49%), approximately ½ were rough (45%), and most were dark in color (85%). The available clinical cues are the lesion's color, surface smoothness, and luster. However, studies that have investigated these characteristics do not agree on whether these cues are significantly associated with depth of penetration [6,11,14,15]. Furthermore, there is no evidence in the literature about how dentists use these cues (either individually or in combination) when judging the extent of caries progression. Such knowledge would be valuable when designing interventions to help dentists maximize the likelihood of appropriate treatment decisions. As a first step in determining how cues are used, this study employed a series of patient vignettes to explore, within dentists, strategies to decide whether caries have penetrated into dentin.

2. Materials and methods

This study is based on vignettes completed by dentists in the network. The network is a consortium of dental practices and dental organizations focused on improving the scientific basis for clinical decision-making [16]. Detailed information about the network is available at its web site [17]. The network's applicable Institutional Review Boards approved the study; all participants provided informed consent after receiving a full explanation of the procedures.

2.1. Selection and recruitment process

Network practitioners were recruited by Regional Coordinators (RC) through letters and announcements sent to licensed practitioners from all six network regions (Western, Midwest, Southwest, South Central, South Atlantic, and Northeast). To be eligible for this study, practitioners had to complete an Enrollment Questionnaire (EQ), attend an orientation session or watch a video of it, and complete their training in human subjects' protection. The EQ, which is publicly available at http://nationaldentalpbrn.org/enrollment.php, collects information about practitioner, practice, and patient characteristics. Once practitioners completed the requirements, the RC provided a training session with the practitioner and staff that included an overview of the study, steps to complete the study, and answered any questions they had related to the study. The network's applicable Institutional Review Boards approved the study.

Once the practitioner agreed to participate in the study, an email with an individualized link was sent to the practitioner to complete the vignettes. It was recommended the practitioner complete the vignettes in one sitting; however, an option of saving and continuing was given. If the vignettes were not completed within a 7-day period, a reminder email was sent to the practitioner. All practitioners completed the vignettes in the timeframe allowed. The study began practitioner recruitment in April 2015 and the study ended in August 2015. 119 practitioners were assessed for eligibility and 12 declined to participate, leaving a total of 107 practitioners who completed the vignettes.

2.1.1. Enrollment questionnaire

As part of the enrollment process, practitioners complete an Enrollment Questionnaire that describes themselves, their practice(s), and their patient population. This questionnaire, which is publicly available at http://nationaldentalpbrn.org/enrollment.php, collects information about practitioner, practice and patient characteristics. Questionnaire items, which had documented test/re-test reliability, were taken from our previous work in a practice-based study of dental care and that PBRN ultimately led to the development of the National Dental PBRN [18,19].

2.2. Participant characteristics of final sample

The purpose was to test hypotheses about what cues/signs dentists used to conclude that the lesion required treatment. Examining the validity of the dentists' treatment decisions was not a part of this study, its focus is exclusively on how dentists use cues in making those decisions. The individual dentist is the unit of analysis and that is our area of interest. Participants were 107 dentists (68 males, 39 females) from the network's 6 regions [16]. The majority of participants were Caucasian (76%), with the remaining 24% comprising minorities from 5 different categories. Mean age (SD) of the participants was 52.5 (11.0), ranging from 29 to 72 years. The participants tended to be experienced practitioners with an average of 24.7 (11.6) years since receiving their dental degree. The range of experience was 2 to 44 years.

2.3. Cue validation procedures

The four cues used in this study were identified from a previous network study on suspicious lesions [7]. Results from that study showed that a majority of lesions were dark brown/black or yellow/light brown, comprising 85% of all lesions. Lesion luster was evenly divided (shiny or chalky), as was roughness (rough or smooth) of the enamel surface as judged with light application of an explorer. The fourth cue, overall caries risk of the patient, was based on various factors, such as fluoride level (93% of patients were categorized as optimal fluoride level), self-care (60% of patients were categorized as good self-care), history of restorations (83% had a history of restorations), and cariogenic diet (25% of patients were categorized as having a cariogenic diet).

Vignettes consisted of a brief description of a patient along with a photograph of a tooth. The patient's caries risk level was dichotomous and was described as low or elevated, as was whether the lesion depicted was rough or smooth. All vignettes used in this study are publicly available on the network website [20].

Yellow/light brown and chalky