Caries Management with the International Caries Detection and Assessment System: Early Pit and Fissure Lesions

Jan Mitchell, DDS*, Martha Brackett, DDS, Mario Romero, DDS
*Corresponding author: janmitche@augusta.edu

Abstract

Introduction: As traditional techniques for detecting occlusal caries by probing fissures with sharp explorers have been discredited, alternate techniques for diagnosing caries in this location have been proposed, such as the International Caries Detection and Assessment System (ICDAS). However, given the novelty of the ICDAS, it became apparent that modules needed to both teach concepts and skills and standardize the faculty teaching of these concepts. Methods: This 4-hour flipped classroom session starts with a short quiz followed by a brief review of key concepts from the presession tutorial. Next, students split into small groups and use a worksheet based on ICDAS criteria to diagnose and create a treatment plan for selected teeth. Finally, the learners perform sealant and preventive resin restoration procedures as appropriate on their selected teeth. All teaching materials are provided to faculty, who are encouraged to become familiar with them in advance. Results: The student response has been very positive; a common student comment has been “I don’t know how I would have had the nerve to treat a patient without this practice.” A retrospective look at patient charts shows a dramatic reduction in the number of treatment plan items changed by faculty following the activity. Discussion: Based on feedback, the exercise was moved from the third year to the second year so students could have more chances to practice prior to seeing patients in the second half of the second year. Further, the exercise has been expanded from two to four sessions, with this being the first.

Keywords
Caries, Diagnosis, Caries Risk Assessment, CAMBRA, Pit and Fissure, ICDAS, Coalesced, Sealant, PRR, Streptococcus Mutans, Fluoride

Educational Objectives
At the conclusion of this educational activity, the learner will be able to:

1. Correctly identify risk factors for pit and fissure caries.
2. Explain different methods for diagnosing and evaluating pit and fissure lesions.
3. Describe the International Caries Detection and Assessment System classification system and a sequence for clinically determining the correct class for a clinical lesion.
4. Explain the indications, rationale, technique, and correct coding for the following treatment options: sealant, preventive resin, and conservative restoration.

Introduction
As traditional techniques for detecting occlusal caries by probing fissures with sharp explorers have been discredited, alternate techniques for diagnosing caries in this location have been proposed. Of these, one of the most clinically useful is the International Caries Detection and Assessment System (ICDAS), which was originally created and validated as a standard for epidemiology and has been further developed by an international group of faculty and researchers as a routine diagnostic tool. It has been...
accepted in many countries and is gaining acceptance in the US. In 2015, a national consensus meeting associated with the American Dental Education Association voted to adopt it as part of a proposed national curriculum framework in teaching caries management. This consensus plan has been endorsed by the cariology and operative sections of the American Dental Education Association and is pending publication.

In moving from preclinical operative courses with simulated, standardized plastic teeth to clinical patient care addressing actual teeth with their wide variety of anatomic variations and staining, learners often have significant difficulty in discerning normal and variants of normal from caries. Further, the options available to treat early caries are still somewhat controversial. These laboratory exercises increase the clinical skills of students and are inserted into the curriculum before the first independent clinical exam experience.

Few practicing dentists in the US are familiar with ICDAS diagnostic criteria. Teaching the ICDAS has proved difficult as it is so different from traditional methods (even if disproven) such as an explorer stick. Despite risk assessment forms being readily available (including on the American Dental Association website) and having recent research evidence to substantiate their use, the concept of caries management by risk assessment (CAMBRA) is still not widely accepted in routine practice. In addition to educating students, it is at least as important to develop modules to teach concepts and skills to the faculty in order to standardize their teaching. This module has proven effective at both these objectives.

The genesis of the exercise was a clinical problem. Careful scrutiny over a 2-year period in the treatment planning clinic showed a significant percentage of discrepancies between what students diagnosed as pit and fissure caries and what was finally treatment planned. There was then a further discrepancy between what was treatment planned and what was actually done once the patient presented for treatment. This highlighted the difficulty not only of teaching this to students but calibrating faculty members. Another impetus was a significant increase in class size at this school; it became an imperative to batch teach these clinical skills to the whole class in a few lab sessions instead of waiting for multiple one-on-one faculty- and time-intensive clinical encounters.

The experience most lacking for the learners was simply looking at real pits and fissures. When developing the experience, the focus was on having learners look at as many teeth as possible and verbalize their observations and then guiding them in simulating clinical decision-making to categorize and treatment plan these teeth. Feedback immediately follows when the learner prepares a tooth and compares his/her prediction with what is actually found. By having learners work in pairs as well as in groups of 10, they are able to see approximately six to 10 teeth in depth with an additional 20 to 30 teeth shared in a session.

Because of our familiarity with and confidence in the team-based learning technique of instruction, we chose to use it here. The background didactic and conceptual material is presented in a self-paced, interactive tutorial, with students mastering this content prior to class time. The key concepts are tested with a short quiz and reinforced by quiz review. By flipping the classroom, time is made available for interactive learning exercises in small groups in lab, in this case, clinical decision-making on caries. Students work in pairs and then in larger groups to verbalize the situation and their thought processes, which can then be corrected or reinforced by the faculty member.

To develop the learning module, a group of faculty with expertise in operative and cariology was formed in 2013 to review the standard teaching references and current literature on pit and fissure caries as well as current treatment recommendations on the spectrum of caries by age and severity. Members of this group are acknowledged in the tutorial. Careful attention was paid to the actual definitions in current Code on Dental Procedure and Nomenclature guidelines of the treatment terms used, as many are used without precise definitions in clinic.
Methods

The target audience is preclinical dental students with the following prerequisites:

1. Operative dentistry course: basic knowledge of dental instrumentation and procedures relating to sealants, preventive restorations, composite restorations, and enamel, dentin bonding procedures.

2. Basic understanding of cariology: key mechanisms of caries process of decalcification of enamel and dentin, as well as an understanding of CAMBRA.

3. Working knowledge of dental operatory procedures and instruments, including personal protection in accordance with Occupational Safety and Health Administration (OSHA) guidelines.

This session is held for the entire class in the preclinical lab in a single afternoon. Before the session, dental students are asked to collect teeth from community dentists and store them in accordance with Center for Disease Control and Prevention guidance. At least 3 weeks prior to the activity, learners are sent the instructional tooth selection slide set (Appendix A) and asked to find similar teeth from their stores of extracted teeth. Part of their module grade is dependent on finding the correct teeth as well as correctly following the instructions for mounting and storage. If this is their first exposure to the ICDAS concept, send the tutorial at the same time to clarify distinctions between ICDAS codes to assist them in identifying the correct teeth.

At least 1 week prior to the lab activity, the learners are either sent via e-mail or given access in a learning management system to the early pit and fissure caries slide set (Appendix B) and the diagnosis lab instructions (Appendix C). The learners are advised that there will be a quiz on the information in the tutorial at the start of the lab session. They are advised to familiarize themselves with the lab instructions and to print a copy to bring with them.

Each station in the lab is set with an operative cassette, hand pieces, and a plaster bowl for containing water spray. A copy of the lab worksheet (Appendix D), printed front and back on a single sheet, is set out at each place. All personal protective equipment (mask, gloves, eye protection) is provided and required to be worn in accordance with OSHA protocols, to simulate clinical situations.

Each 10 learners are assigned a faculty member who is familiar with the tutorial, ICDAS, and faculty instructions and comfortable with small-group interactive teaching. Spend about 10 minutes on the included quiz (Appendix E) or your own six-question quiz on the knowledge base in the tutorial. A suggested grading technique is to print a handout page from the slide set and count off 10 points for each wrong answer; only give a zero for unexcused absence. Using the same slide set, go over the quiz and highlight important material to ensure all learners have mastered key knowledge points. Notes are included in the quiz module with each slide to guide faculty.

Next, divide into groups and retrieve teeth from storage. Distribute the diagnosis lab instructions to learners (or have them take out the copy they printed). Have faculty members use the lab instructor guide (Appendix F) for suggestions on guiding discussion. In this first overview, the instructor takes one tooth and has each learner quickly express an opinion on which ICDAS category she/he thinks it is and why. After all have spoken, the faculty member can then refine their thinking. Repeat this exercise until they are skilled enough to work on their own (usually three to five teeth).

On the diagnosis lab worksheet, have each learner complete the occlusal features and defects list for each tooth and select the correct ICDAS category, then compare with his/her partner and come to a consensus. At this point, the instructor will get the group members together to discuss and share their thoughts on difficulties in categorizing teeth, allowing the faculty to refine their observations and thinking.

First working first alone and then comparing results in pairs, have the learners complete the treatment plan section on the second page on their teeth, as well as marking any pits and fissures they feel need to be biopsied. Bring the group together, and again discuss the issues of why the treatment plan is different for
different groups. Discuss the issue of caries risk assessment and how it might affect the choices. The instructor signs off on the treatment plan for each learner, asking questions on their rationale while doing so.

Using a ¼ round bur, learners carefully follow each groove and pit, removing only the decalcified enamel or stained groove and stopping when sound enamel or dentin is reached. The learner can then determine the extent of the enamel caries and whether or not there is dentin caries. This allows the learner to close the loop on her/his initial observations and determine the actual ICDAS category, writing it on the Post-tx section of the front page. Bring the group together, and share any interesting cases. Note that there is no praise or criticism given to how accurate a learner’s initial judgment was or was not. It is important that grades be dependent on preparation and effort to follow instructions only, not on accuracy, which would be luck at this point.

If this is the only lab planned, the lab may progress to concepts of lateral extension for clean dental enamel junction, caries removal, etc. If a series of labs is planned, however, you may stop here and concentrate on concepts of conservative restoration such as sealant, preventive resin restoration, and very conservative composite restorations. You may choose to restore one or all of the teeth to reinforce or introduce new techniques, depending on place in curriculum.

Results
The caries continuum exercises have been generally well received from the beginning. A common student comment has been “I don’t know how I would have had the nerve to treat a patient without this practice.” The exercise has been instrumental in standardizing clinical faculty in their diagnosis and treatment planning concepts.

In the treatment planning clinic, the exercise has proven an effective mechanism for guiding learners in the initial objective, which was more accurate diagnosis and treatment planning of pit and fissure caries. The amount of time spent rewriting poor treatment plans has vastly reduced as there is a significant reduction in the number of false positives of caries diagnosis in clinic. Appointments that require more than the allotted hour are significantly less frequent, and the faculty have all commented how much more accurate the students are. A retrospective look at charts shows the number of strikeout treatment planned items that were changed after faculty review is dramatically reduced.

Operative faculty have noted that students are better able to estimate the size of planned restorations as well. As part of a vigorous sophomore clinical program, the exercise has jump-started our learners by approximately 6 months, with learners performing in junior clinic in the summer at a level not previously seen until the spring.

With increased class size and a push to do more with less, this is a crucial improvement in that faculty can now, in a series of lab sessions, batch teach what they used to laboriously teach one by one chairside in clinic. The most important advantage is that this teaching was formerly highly variable from instructor to instructor; now, it is standardized. In fact, participation by new faculty has become an important learning and standardization tool.

This concept was so popular with learners and helpful clinically that it was expanded at our institution to four sessions: Caries Management With ICDAS 1: Codes 0-2; Caries Management With ICDAS 2: Code 3-4, covering lateral extension and caries excavation; Caries Management With ICDAS 3: Code 5-6, including vital pulp therapy; and Anterior Smooth Surface Lesions. We hope to publish those modules in the future as well.

Discussion
This exercise has been used successfully for 3 years, first in 2013 to prepare third-year dental students for clinical care. Student evaluations were highly positive but asked for the exercise earlier in the curriculum, which convinced us to move it forward to the second year. There, it has been implemented for 2 years as
an integrated part of the sophomore clinical curriculum just prior to the first clinical operative experience. Both students and faculty report high satisfaction with this temporal association.

Originally, the exercise was only two sessions, but the success of overall learning and satisfaction have caused an expansion to four lab sessions, utilizing progressively more extensive levels of carious extracted teeth.

The biggest issue was students bringing the wrong sort of teeth. Consequently, the primary assessment is on the care they expend on tooth selection, as sorting through jars of extracted teeth is a tedious, unpleasant job. However, even this has learning value as they compare their teeth against the ICDAS criteria to find the correct ones for each of the different lab exercises.

The most effective faculty are those who sit with the learners and keep up a running dialog of questions, observations, and clinical correlations. Because of the interactive nature of the exercise and the opportunity to share expertise and improve clinical outcomes, it is a very popular section to teach.

Unfortunately, the Center for Disease Control and Prevention’s recommended sterilization processes involved in using extracted human teeth (storage in dilute bleach and autoclaving) change the appearance of carious teeth if extended for more than a few months. Additionally, students will only see the teeth that they and their partner have selected unless there is a significant teaching effort by the faculty to highlight in group discussions as many different presentations of caries as possible.

Jan Mitchell, DDS: Associate Professor, Department of Oral Rehabilitation, Dental College of Georgia at Georgia Regents University
Martha Brackett, DDS: Associate Professor, Department of Oral Rehabilitation, Dental College of Georgia at Georgia Regents University
Mario Romero, DDS: Assistant Professor, Department of Oral Rehabilitation, Dental College of Georgia at Georgia Regents University

Disclosures
None to report.

Funding/Support
None to report.

Ethical Approval
Reported as not applicable.

References


Received: October 23, 2015 | Accepted: February 25, 2016 | Published: April 14, 2016