



Oral Health Critically Appraised Topics (CATs)

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CEJ Automated Probing System Is More Reliable Than Manual or the Florida Probe When Detecting Clinical Attachment Loss for Patients with Chronic Periodontitis

Clinical question	In adult patients, is the cementoenamel junction (CEJ) automated probing system more reliable than the Florida stent probe (FSP) and the UNC-15 manual probe?			
Clinical bottom line	The CEJ automated probing system is more consistent and dependable than the FSP or manual probing in detecting clinical attachment loss (CAL). For patients with periodontal disease, studies show that the CEJ automated probing system has a high degree of validity. This is supported by comparative studies that include both periodontally healthy and diseased patients.			
Best evidence/references	Pubmed ID 22654322	Author/Year Deepa and Prakash/2012 ¹	Patient group Males and females 35 to 45 years of age with chronic periodontitis in the case group, and with healthy periodontal status in the control group	Study type (level of evidence) Comparative study
Key results	The CEJ automated probe displays "higher intra- and inter-examiner consistency over Florida Stent Probe (FSP) and UNC-15 manual probe in both the case and control groups." The FSP was more reproducible than the manual probe in measuring CAL.			
Best evidence/references	Pubmed ID 15016020	Author/Year Karpinia et al/2004 ²	Patient group 12 periodontal patients, 22 to 74 years of age	Study type (level of evidence) Comparative study
Key results	There is a direct correlation between the examiner and the type of probe used. The accuracy of probing depends on the type of probe used and the expertise of the examiners. The CEJ probe exhibits a more consistent measurement of CAL. The CEJ probe displayed "greater intra-examiner" accuracy compared to the traditional probe for two examiners ($P < .01$). Also, the CEJ probe showed significant "inter-examiner consistency ($P < .01$)."			
Evidence search	automated[All Fields] AND probing[All Fields] AND ("manuals as topic"[Mesh Terms] OR ("manuals" [All Fields] AND "topic"[All Fields]) OR "manuals as topic"[All Fields] OR "manual"[All Fields]) AND probing[All Fields]			
Comments on the evidence	<p>Validity: Both studies were comparative studies that measured accuracy of probing in terms of intra- and inter-examiner consistency. The probing order was randomized in both studies, and both studies included patients with chronic periodontitis and healthy patients. The study by Karpinia et al² included investigators with various levels of clinical skills, which increases the external validity of the study. In both studies, the measurements were repeated at a second visit; however, in the Karpinia et al study,² there was only 1 week between visits.</p> <p>Perspective: After evaluating both articles, dental hygienists are more confident that the CEJ automated probing system is consistent in evaluating CAL. The CEJ probe will provide excellent diagnostic results.</p>			
Applicability	The evidence shows the efficiency of utilizing the CEJ automated probing system in detecting CAL in all periodontal patients.			
Specialty	General Dentistry, Periodontics			
Keywords	automated probing, manual probing			
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Date of submission	12/02/2015			
UT CAT ID# 2910	https://cats.uthscsa.edu/published_cats_friendly.php?id=2910			

¹Deepa R, Prakash S. Accuracy of probing attachment levels using a new computerized cement-enamel junction probe. *J Indian Soc Periodontol* 2012;16:74–79.

²Karpinia K, Magnusson I, Gibbs C, Yang MC. Accuracy of probing attachment levels using a CEJ probe versus traditional probes. *J Clin Periodontol* 2004;31:173–176.

Silver Diamine Fluoride May Be Better Than Sodium Fluoride Varnish in Arresting and Preventing Cavitated Caries Lesions

Clinical question	In children at high risk for caries, is silver diamine fluoride (SDF) solution compared with sodium fluoride (NaF) varnish more effective in preventing/arresting caries?			
Clinical bottom line	Both annual application of 38% SDF solution and biannual application of 5% NaF varnish are clinically effective in arresting and preventing the progression of caries lesions in the primary dentition and pits/fissures of permanent first molars, with no significant difference from one another in their effectiveness. There is some evidence supporting the use of SDF over NaF varnish with most studies performed on primary teeth, but the evidence was insufficient and limited. Most of the studies suggested higher efficacy of SDF in the primary dentition; however, one study demonstrated that SDF promotes a faster arrestment of caries lesions in permanent first molars. This is supported by a systematic review of two well-conducted randomized clinical trials (RCTs). SDF is highly effective, inexpensive, and easy to apply. It was suggested by the World Health Organization (WHO) for use when dental resources are limited.			
Best evidence/ references	Pubmed ID 22736448	Author/Year Liu et al/2012 ¹	Patient group 501 children, mean age 9.1 years, with at least one sound permanent first molar with deep fissures or with early signs of caries	Study type (level of evidence) Randomized controlled trial
Key results	All treatment options, including sealant, NaF varnish, and SDF, are effective in preventing pit and fissure caries in permanent molars. The three treatment groups had significantly lower risk of caries than did the controls ($P < .05$). Proportions of pits and fissures with caries in the sealant, NaF varnish, SDF, and control groups were 1.6%, 2.4%, 2.2%, and 4.6%, respectively, and were not significantly different ($P > .05$). The percentage of sites with caries in the control group (4.6%) was significantly higher than those in the three treatment groups ($P = .002$) at the 24-month follow up. The prevented fractions (PFs) were 65%, 48%, and 52% for sealant, NaF varnish, and SDF solution, respectively.			
Best evidence/ references	Pubmed ID 19278981	Author/Year Rosenblatt et al/2009 ²	Patient group 1 to 375 children aged 3 to 5 years with carious maxillary anterior teeth ^{3,4}	Study type (level of evidence) Systematic review of RCTs
Key results	The results indicate that SDF was more effective than NaF varnish in both arresting and preventing caries. The lowest PFs for caries arrest and caries prevention for SDF were 96.1% and 70.3%, respectively. On the other hand, NaF varnish's highest prevented fractions for caries arrest and caries prevention were 21.3% and 55.7%, respectively. The number needed to treat (NNT) also demonstrated the benefit of SDF when compared with NaF varnish. Similarly, SDF's highest NNTs for caries arrest and caries prevention were 0.8 (95% CI = 0.5 to 1.0) and 0.9 (95% CI = 0.4 to 1.1), respectively. For NaF varnish, the lowest NNTs for caries arrest and prevention were 3.7 (95% CI = 3.4 to 3.9) and 1.1 (95% CI = 0.7 to 1.4), respectively.			
Evidence search	(Silver Diamine) AND Sodium Fluoride Varnish			
Comments on the evidence	<p>Validity: In the first article, the enrolled subjects were randomly assigned to either the treatment or control group using computer-generated numbers. 97% of the subjects were followed for 24 months, a reasonable length of time for caries to form. The number of dropouts was reasonable; for uncontrollable reasons the study had a 10% dropout rate. Intra-examiner reproducibility was tested. Treatment was carried out in a standardized technique. SDF was compared to the more frequently used NaF varnish and other effective and common techniques for caries prevention. A drawback of the study was that no blinding of investigators was undertaken. In the systematic review, the search strategy was sufficient, searching multiple online libraries and in multiple languages for a long time window, from 1966 to 2006, using good inclusion and exclusion criteria. One of the studies examined only the primary maxillary anterior teeth³ while the second⁴ extended to permanent molars. This diversity is good but might limit the strength of evidence pertaining to clinical application choice. The effect on permanent teeth might be different than the effect on primary dentition, due to different structural biology between primary and permanent enamel and dentin. The two studies applied SDF either annually or biannually, and obtained similar results, suggesting that one application is sufficient.</p> <p>Perspective: In my opinion, both studies were well conducted. According to my search, only one systematic review of two RCTs was available. More RCTs are needed. Results were inconclusive. Both treatment options are effective in arresting and preventing caries, with some evidence suggesting the use of SDF to be more effective.</p>			

¹Liu BY, Lo EC, Chu CH, Lin HC. Randomized trial on fluorides and sealants for fissure caries prevention. *J Dent Res* 2012;91:753–758.

²Rosenblatt A, Stamford TC, Niederman R. Silver diamine fluoride: A caries "silver-fluoride bullet." *J Dent Res* 2009;88:116–125.

³Chu CH, Lo EC, Lin HC. Effectiveness of silver diamine fluoride and sodium fluoride varnish in arresting dentin caries in Chinese preschool children. *J Dent Res* 2002;81:767–770.

⁴Llodra JC, Rodriguez A, Ferrer B, Menardia V, Ramos T, Morato M. Efficacy of silver diamine fluoride for caries reduction in primary teeth and first permanent molars of schoolchildren: 36-month clinical trial. *J Dent Res* 2005;84:721–724.

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Silver Diamine Fluoride May Be Better Than Sodium Fluoride Varnish in Arresting and Preventing Cavitated Caries Lesions

Applicability	Although most clinicians will focus on permanently restoring caries lesions, topical fluorides including SDF and NaF varnish provide an excellent alternative for the arrest of caries until more definitive treatment is undertaken. SDF is effective, inexpensive, and has minimal side effects. WHO supports the use of topical fluoride to arrest caries, especially when access to dental care is limited. Also, it is a valuable option to arrest early childhood caries, when final treatment cannot be carried out due to the patient's young age and inability to cooperate in the dental office.
Specialty	Public Health, General Dentistry, Pediatric Dentistry
Keywords	arrest, dental caries, fluoride, prevention, silver diamine fluoride, sodium fluoride varnish
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UT CAT ID# 2924	https://cats.uthscsa.edu/published_cats_friendly.php?id=2924

In Pregnant Women, Diagnostic Dental Radiation Does Not Increase the Incidence of Congenital Anomalies

Clinical question	In pregnant women, does diagnostic dental radiation increase the incidence of congenital anomalies?								
Clinical bottom line	Based on this laboratory study, the exposure dose during dental radiography is far lower than the dose needed to cause anomalies in fetus.								
Best evidence/ references	<table border="1"> <thead> <tr> <th>Pubmed ID</th> <th>Author/Year</th> <th>Patient group</th> <th>Study type (level of evidence)</th> </tr> </thead> <tbody> <tr> <td>26313308</td> <td>Kelaranta et al/2015¹</td> <td>One anthropomorphic female phantom</td> <td>Laboratory study</td> </tr> </tbody> </table>	Pubmed ID	Author/Year	Patient group	Study type (level of evidence)	26313308	Kelaranta et al/2015 ¹	One anthropomorphic female phantom	Laboratory study
Pubmed ID	Author/Year	Patient group	Study type (level of evidence)						
26313308	Kelaranta et al/2015 ¹	One anthropomorphic female phantom	Laboratory study						
Key results	The results of the study estimated the fetal doses at 0.009 to 6.9 µGy, and the breast doses at 0.602 to 75.4 µGy; with lead shields, these doses are less (fetal doses 0.005 to 2.1 µGy, and breast doses 0.002 to 10.4 µGy). Accordingly, the fetal dose levels without lead shielding were less than 1% of the annual dose limit, which is 1 mSv for a member of the public. In intraoral, panoramic, and cephalometric examinations without lead shields, the fetal doses reached 0.1% to 10% of the maximum fetal doses in CBCT.								
Evidence search	("dental health services"[MeSH Terms] OR ("dental"[All Fields] AND "health"[All Fields] AND "services"[All Fields]) OR "dental health services"[All Fields] OR "dental"[All Fields]) AND ("radiology"[MeSH Terms] OR "radiology"[All Fields] OR "radiography"[MeSH Terms] OR "radiography"[All Fields]) AND ("foetus"[All Fields] OR "fetus"[MeSH Terms] OR "fetus"[All Fields]) AND ("pregnancy"[MeSH Terms] OR "pregnancy"[All Fields])								
Comments on the evidence	Validity: This was a laboratory dosimetry study, a valuable addition to the literature as it addressed a range of current dental radiographic exposures. Although there have been population-based human studies on diagnostic radiology-related cancer induction, no population-based human studies have been published on fetal effects from dental diagnostic radiography.								
Applicability	Although this was a preclinical (ie, laboratory) study, the fetal doses measured were greatly below the threshold dose known, from other studies, to induce fetal abnormalities.								
Specialty	Public Health, Oral Medicine/Pathology/Radiology, General Dentistry								
Keywords	dental radiology, fetus, pregnancy, safety								
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Date of submission	11/05/2015								
UT CAT ID# 2943	https://cats.uthscsa.edu/published_cats_friendly.php?id=2943								

¹Kelaranta A, Ekholm M, Toroi P, Kortensniemi M. Radiation exposure to foetus and breasts from dental X-ray examinations: Effect of lead shields. *Dentomaxillofac Radiol* 2016;45(1):20150095.

Fluoride Reduces Dental Erosion

Clinical question	In patients with dental erosion, does the use of fluoride effectively reduce the amount of dental erosion as compared with no treatment?			
Clinical bottom line	For patients experiencing dental erosion, fluoride treatment is effective in protecting the enamel and decreasing surface loss. Three laboratory studies prove that fluoride treatment reduces enamel wear and erosion; two of these trials specifically address stannous fluoride (SnF ₂) as displaying the greatest amount of enamel protection.			
Best evidence/ references	Pubmed ID 24571700	Author/Year Faller and Eversole/2014 ¹	Patient group Unspecified number of extracted human enamel specimens	Study type (level of evidence) Laboratory study
Key results	Enamel samples treated with SnF ₂ showed the greatest amount of surface protection and the lowest amount of dye adherence. Mean dye depositions were 0.25 for SnF ₂ , 3.4 for sodium fluoride (NaF), 3.4 for sodium monofluorophosphate (SMFP), and 3.7 for amine fluoride (AmF) specimens. SnF ₂ had a statistically significant amount of enamel protection ($P < .05$) when compared with NaF, SMFP, and AmF.			
Best evidence/ references	Pubmed ID 23006823	Author/Year Stenhagen et al/2013 ²	Patient group 16 molars cut into 4 specimens	Study type (level of evidence) Laboratory study
Key results	Teeth rinsed with stannous fluoride (SnF ₂) or titanium tetrafluoride (TiF ₄) reduced enamel wear and erosion. SnF ₂ had a mean surface loss of 1.8 µm after 9 days; TiF ₄ had a mean surface loss of 3.1 µm; and NaF had a mean surface loss of 26.3 µm. The control that was left untreated had a mean surface loss of 32.3 µm. Rinsing with SnF ₂ , TiF ₄ , and NaF decreased the abrasion and enamel wear by 94%, 90%, and 18%, respectively, when compared with the control ($P = .05$).			
Best evidence/ references	Pubmed ID 21780973	Author/Year Magalhães et al/2012 ³	Patient group Unspecified number of bovine dentin specimens	Study type (level of evidence) Laboratory study
Key results	All fluoridated varnishes were proven by analysis of variance (ANOVA) and Tukey post hoc test to significantly decrease dentin tissue loss. TiF ₄ 6.5 ± 1.0, NaF 7.2 ± 1.9, Duofluorid 6.8 ± 1.1, and Duraphat 7.5 ± 1.1 fluoride varnishes reduced dentin tissue loss by 40.7% when compared to the control.			
Evidence search	(("Tooth Erosion/analysis"[Mesh] OR "Tooth Erosion/epidemiology"[Mesh] OR "Tooth Erosion/pathology"[Mesh] OR "Tooth Erosion/physiology"[Mesh] OR "Tooth Erosion/physiopathology"[Mesh] OR "Tooth Erosion/prevention and control"[Mesh]) AND "Fluorides"[Mesh])			
Comments on the evidence	All of these studies were laboratory studies. In Faller and Eversole, ¹ extracted teeth were soaked in saliva, etched with citric acid, and treated with either SnF ₂ , NaF, SMFP, or AmF. After each of the specific fluoride treatments, the teeth were exposed to a calcium dye and rinsed again. The ability of the fluoride to leave a barrier layer was calculated by the amount of dye attachment to the enamel. SnF ₂ demonstrated the highest level of enamel protection by showing the least amount of dye attachment. Based on a scale where 0 represented no dye deposition and 4 indicated complete coverage by the dye, SnF ₂ was 0.25. This study demonstrates that SnF ₂ leaves a barrier over the enamel that protects the tooth. In Stenhagen et al, ² 16 molars were cut into four pieces. Each of the four pieces had an amalgam present. Two teeth (represented by eight different pieces) were mounted bilaterally on mandibular appliances and worn by eight volunteers. Each day, all samples were brushed manually. Three pieces of the same tooth were then exposed to different types of treatment, including SnF ₂ , TiF, and NaF. The fourth piece was the control. Twice each day, the samples were etched with hydrochloric acid and rinsed with water. SnF ₂ demonstrated the least amount of surface loss after 9 days. Thus, SnF ₂ reduces the amount of tooth structure lost due to acid exposure. In Magalhães et al, ³ bovine dentin studies were treated with NaF-Duraphat, NaF/CaF ₂ -Duofluorid, experimental NaF, experimental TiF ₄ , and placebo varnishes. The teeth were then exposed to a soft drink for 90 seconds four times a day and to toothbrushing for 10 seconds two times a day. ANOVA indicated that all of the fluoride varnishes reduced dentin loss. Thus, the fluoride varnishes were proven to protect the teeth against the damaging effects of acid.			

¹Faller RV, Eversole SL. Protective effects of SnF₂ – Part III. Mechanism of barrier layer attachment. *Int Dent J* 2014;64(suppl 1):16–21.

²Stenhagen KR, Hove LH, Holme B, Tveit AB. The effect of daily fluoride mouth rinsing on enamel erosive/abrasive wear in situ. *Caries Res* 2013;47:2–8.

³Magalhães AC, Levy FM, Rizzante FA, Rios D, Buzalaf MA. Effect of NaF and TiF₄ varnish and solution on bovine dentin erosion plus abrasion in vitro. *Acta Odontol Scand* 2012;70:160–164.

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Fluoride Reduces Dental Erosion

Applicability	The external validity for these studies is low because these laboratory studies used either extracted human teeth or animal teeth to test the effectiveness of fluoride treatment. However, based on this evidence, it appears that fluoride treatment effectively protects the enamel and reduces the amount of damage caused by erosion. SnF ₂ has been proven to display the greatest amount of enamel protection. Thus, based on these studies, fluoride can be used by the dentist to help prevent tooth damage from erosion in patients with a high risk of erosion, such as patients with gastroesophageal reflux. Patients at risk of erosion would benefit from fluoride treatment.
Specialty	General Dentistry, Restorative Dentistry
Keywords	dental erosion, fluoride
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Visual Inspection for Caries Remains the Clinical Diagnostic Standard

Clinical question	For an average adult patient, is visual inspection alone sufficient to accurately diagnose nonproximal caries?			
Clinical bottom line	Visual inspection alone is a reliable method to diagnose caries. A meta-analysis and systematic review reached that same basic conclusion. However, the evidence demonstrates moderate heterogeneity and publication bias.			
Best evidence/ references	Pubmed ID	Author/Year	Patient group	Study type (level of evidence)
Key results	25994176	Gimenez et al/2015 ¹	102 articles	Meta-analysis
Key results	Visual inspection of lesions demonstrates a good level of accuracy and high specificity in the diagnosis of caries. However, validated visual scoring systems have proven to increase the accuracy of visual inspection.			
Best evidence/ references	Pubmed ID	Author/Year	Patient group	Study type (level of evidence)
Key results	25180412	Gomez et al/2013 ²	42 articles	Systematic review of randomized trials
Key results	There was high variability in sensitivity and specificity with visual detection of caries (limitations shared by all alternative diagnostic methods). Visual detection is recommended as the standard for clinical practice.			
Evidence search	("Dental Caries/diagnosis" [Majr] AND (Meta-Analysis[ptyp] OR systematic[sb])) AND (visual[All Fields] AND detection[All Fields]) AND (Meta-Analysis[ptyp] OR systematic[sb])			
Comments on the evidence	Gimenez: Specificity was deemed more important than sensitivity for caries diagnosis by the authors. This decision impacted their conclusions, as specificity was uniformly higher than sensitivity. Most reviewed studies displayed moderate to high heterogeneity and had evidence of publication bias. Gomez: Quality of evidence for visual detection of caries was deemed low.			
Applicability	Due to the nature of studies assessing caries diagnosis, unbiased and clear results are hard to achieve. However, visual detection of caries remains the clinical standard, as it is a simple, low-cost method for caries detection that demonstrates few false positives. Utilization of a validated visual scoring system is recommended.			
Specialty	General Dentistry			
Keywords	dental caries, diagnosis, visual detection, caries, cavities, interproximal decay, pit (fissure) cavity(ies), decay, tooth decay, smooth surface cavity(ies)			
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Faculty mentor/coauthor	Stephan J. Haney, DDS; haney2@uthscsa.edu			
Date of submission	10/20/2015			
UT CAT ID #2955	https://cats.uthscsa.edu/published_cats_friendly.php?id=2955			

¹Gimenez T, Piovesan C, Braga MM, et al. Visual inspection for caries detection: A systematic review and meta-analysis. J Dent Res 2015;94:895–904.

²Gomez J, Tellez M, Pretty IA, Ellwood RP, Ismail AI. Non-cavitated carious lesions detection methods: A systematic review. Community Dent Oral Epidemiol 2013;41:54–66.