Indian Country Oral Health ECHO:
Minimally Invasive Dentistry

WELCOME!

"The Case For Selective Caries Removal"

Photo of artwork in CTCLUSI tribal offices

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Northwest Portland Area Indian Health Board

Established in 1972, the Northwest Portland Area Indian Health Board (NPAIHB or the Board) is a non-profit tribal advisory organization serving the forty-three federally recognized tribes of Oregon, Washington, and Idaho. Each member tribe appoints a Delegate via tribal resolution and meets quarterly to direct and oversee all activities of NPAIHB.

"Our mission is to eliminate health disparities and improve the quality of life of American Indians and Alaska Natives by supporting Northwest Tribes in their delivery of culturally appropriate, high-quality healthcare."

Indian Country Oral Health ECHO:
Minimally Invasive Dentistry

DISCLAIMER:
We have no financial disclosures or conflicts of interest with the information in this presentation.

Photo of artwork in Nez Perce National Historical Park Visitor Center

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Objectives:

Upon completion of this course, participants will be able to:

1. **Build minimally invasive dentistry skills.**

2. **Recognize risk factors and apply preventive measures to reduce the occurrence of oral health disease.**

3. **Learn techniques on how to treat patients with holistic and culturally appropriate care.**

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“The evidence-base for survival of restorations clearly indicates that restoring teeth is a temporary palliative measure that is doomed to fail if the disease that caused the condition is not addressed properly.”

https://pubmed.ncbi.nlm.nih.gov/15646587/

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Oral Health Prev Dent. 2004;2 Suppl 1:287-92.

What is minimally invasive dentistry?

Dan Ericson [1]

Affiliations + expand

PMID: 15646587

Abstract

Minimally Invasive Dentistry is the application of "a systematic respect for the original tissue." This implies that the dental profession recognizes that an artifact is of less biological value than the original healthy tissue. Minimally invasive dentistry is a concept that can embrace all aspects of the profession. The common delineator is tissue preservation, preferably by preventing disease from occurring and intercepting its progress, but also removing and replacing with as little tissue loss as possible. It does not suggest that we make small fillings to restore incipient lesions or surgically remove impacted third molars without symptoms as routine procedures. The introduction of predictable adhesive technologies has led to a giant leap in interest in minimally invasive dentistry. The concept bridges the traditional gap between prevention and surgical procedures, which is just what dentistry needs today. The evidence-base for survival of restorations clearly indicates that restoring teeth is a temporary palliative measure that is doomed to fail if the disease that caused the condition is not addressed properly. Today, the means, motives and opportunities for minimally invasive dentistry are at hand, but incentives are definitely lacking. Patients and third parties seem to be convinced that the only things that count are replacements. Namely, they are prepared to pay for a filling but not for a procedure that can help avoid having one.

Outline:

1. Didactic Presentation
   - The Case For Selective Caries Removal

2. Case Presentations
   - Dr. Matthew Wolpert

     Sophie Trettevick Health Center (Makah Tribe) – Neah Bay, WA

   - Dr. Taylor Wilkens

     Marimn Health & Wellness Center (Coeur D'Alene Tribe) – Plummer, ID

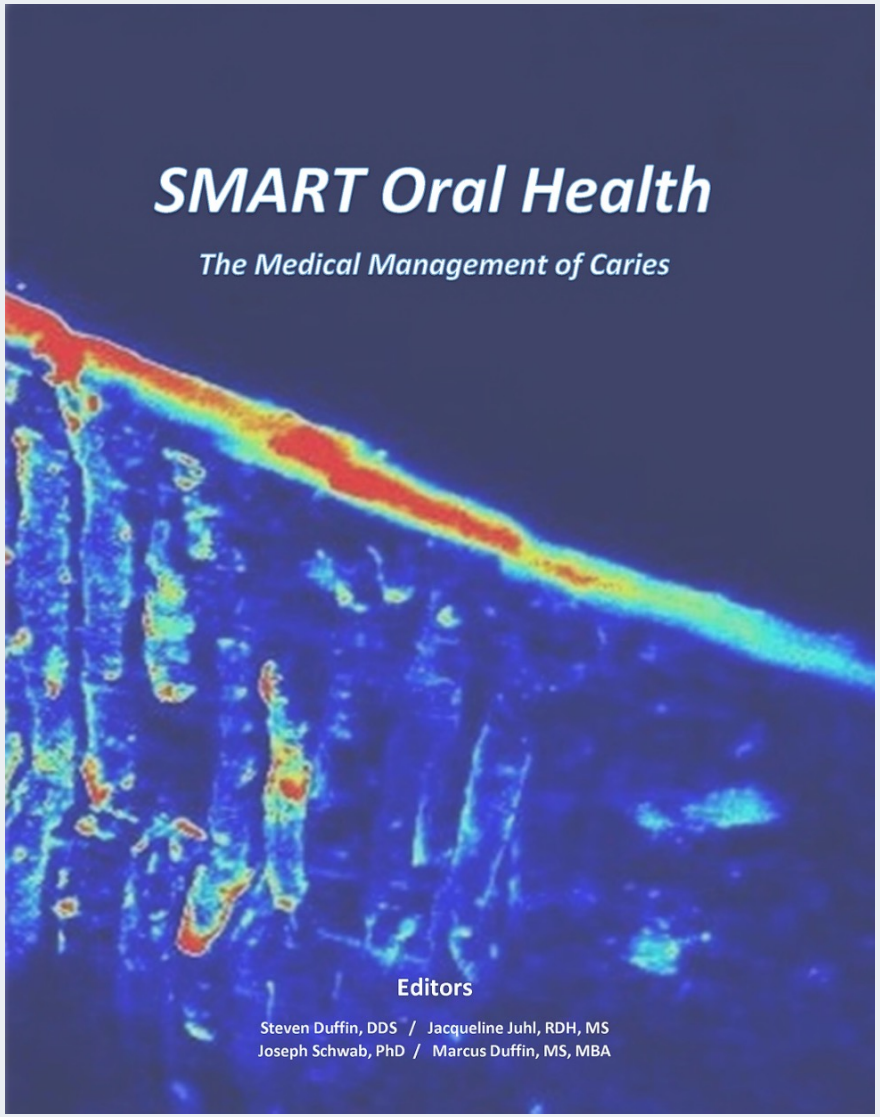
3. Group Discussion
   - Q&A

Didactic Presentation

SMART Oral Health:

The Medical Management of Caries

www.smartoralhealth.com



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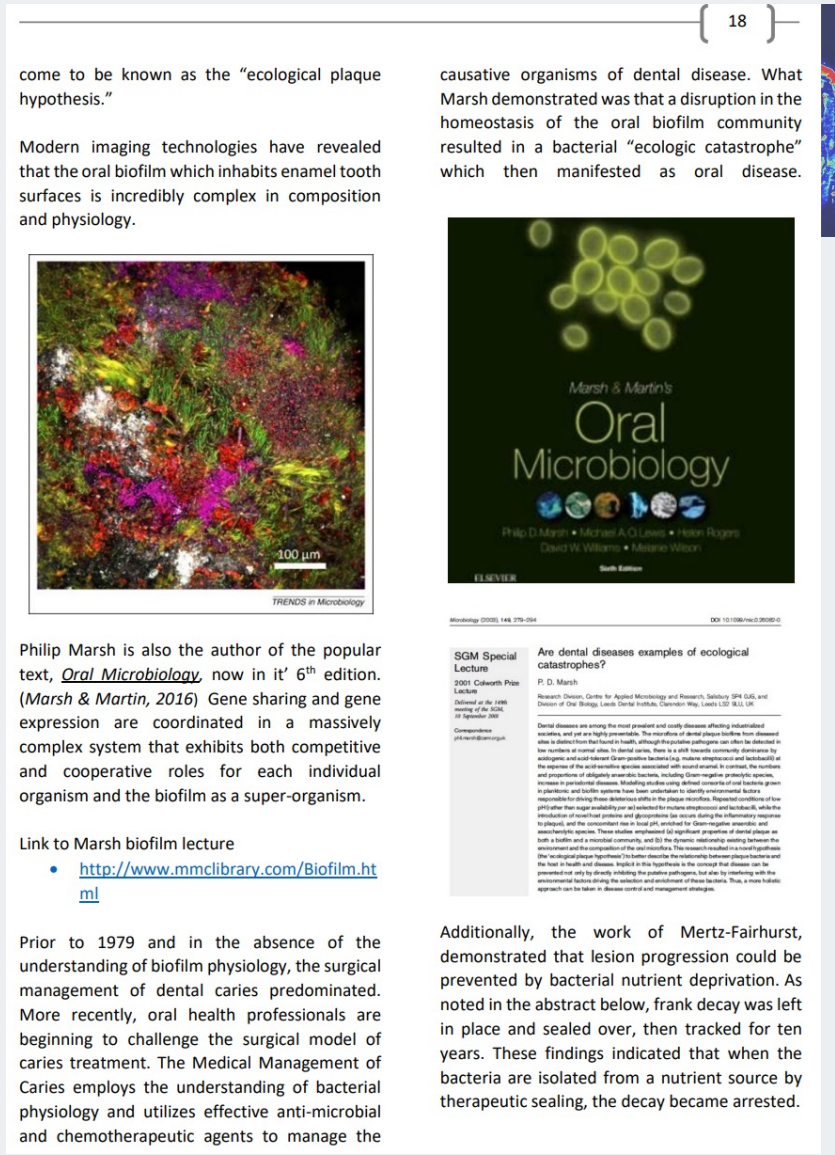
Biofilm:

More recently, oral health professionals are beginning to challenge the surgical model of caries treatment. The Medical Management of Caries employs the understanding of bacterial physiology and utilizes effective anti-microbial and chemotherapeutic agents to manage the causative organisms of dental disease.

What Marsh demonstrated was that a disruption in the homeostasis of the oral biofilm community resulted in a bacterial “ecologic catastrophe” which then manifested as oral disease.

Additionally, the work of Mertz-Fairhurst, demonstrated that lesion progression could be prevented by bacterial nutrient deprivation. As noted in the abstract below, frank decay was left in place and sealed over, then tracked for ten years. These findings indicated that when the bacteria are isolated from a nutrient source by therapeutic sealing, the decay became arrested.



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come to be known as the “ecological plaque hypothesis.”

Modern imaging technologies have revealed that the oral biofilm which inhabits enamel tooth surfaces is incredibly complex in composition and physiology.

Philip Marsh is also the author of the popular text, *Oral Microbiology*, now in it’ 6th edition. (*Marsh & Martin, 2016*) Gene sharing and gene expression are coordinated in a massively complex system that exhibits both competitive and cooperative roles for each individual organism and the biofilm as a super-organism.

Link to Marsh biofilm lecture

- http://www.mmclibrary.com/Biofilm.html

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SGM Special Lecture

2001 Colworth Prize Lecture

Are dental diseases examples of ecological catastrophes?

P. D. Marsh

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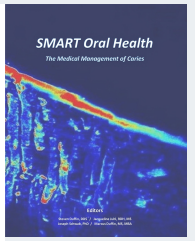

https://www.smartoralhealth.com/

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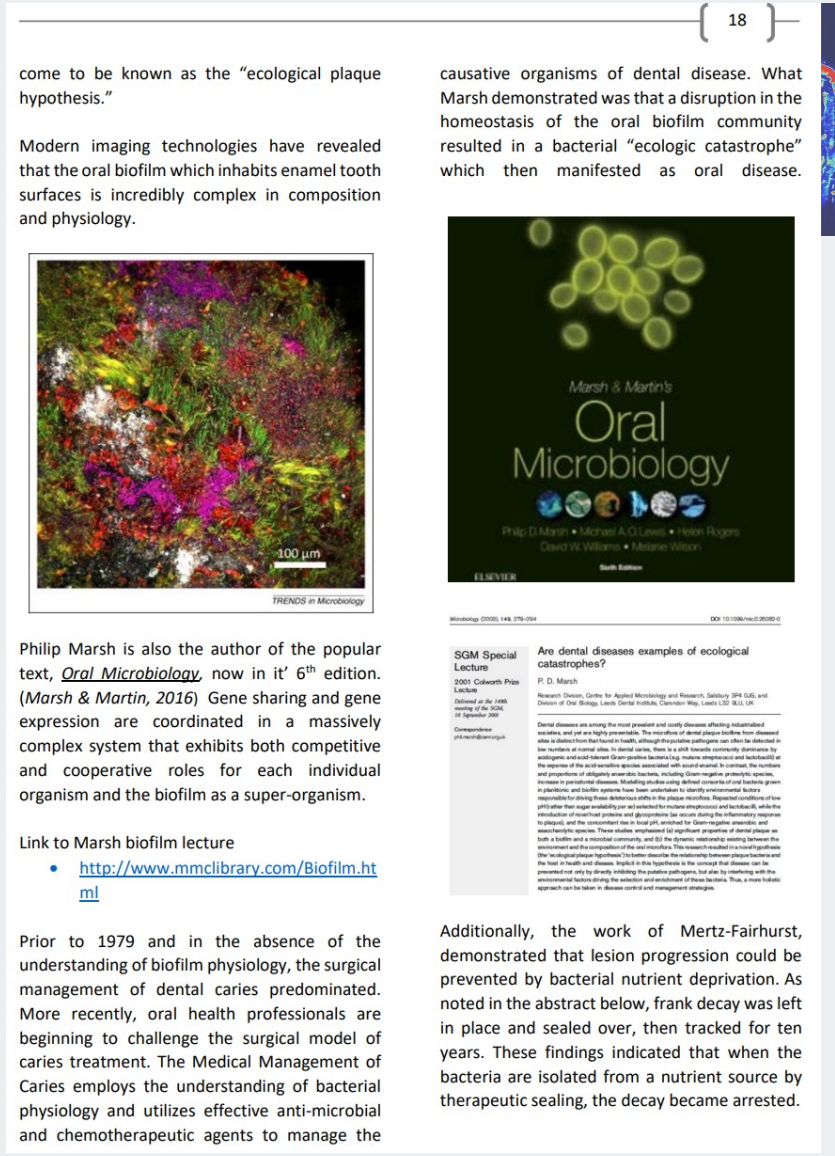
Biofilm:

This challenges the established belief that decay must be physically removed from the tooth prior to the placement of a restoration.

Non-surgical Intervention and Treatment to Starve Biofilm

“Ultraconservative and cariostatic sealed restorations: results at year 10.” (Mertz-fairhurst et al., 1998) Below is the abstract pulled from this publication.

Abstract “Changes in restorative techniques and the development of newer restorative materials have allowed for the introduction of more conservative cavity preparations. This 10-year study evaluated bonded and sealed composite restorations placed directly over frank cavitated lesions extending into dentin vs. sealed conservative amalgam restorations and conventional unsealed amalgam restorations. The results indicate that both types of sealed restorations exhibited superior clinical performance and longevity compared with unsealed amalgam restorations. Also, the bonded and sealed composite restorations placed over the frank cavitated lesions arrested the clinical progress of these lesions for 10 years.”



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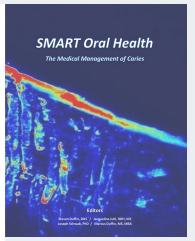

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Biofilm:

Caries (tooth decay) and conditions of the gingiva and supporting structures (gingivitis and periodontitis) are largely a result of interactions between oral bacteria and human tissues.

These processes can be examined with the sophisticated tools of molecular biology. We can divide this section into two large categories.

1. The effects of SDF application on tooth structure

2. The effect of SDF on bacterial physiology

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Introduction

(Dr. Steve Duffin, DDS)

The following section will introduce the reader to some of the powerful tools of molecular biology and how these technologies are being employed in understanding the processes taking place when silver, fluoride and glass ionomer materials are being used in clinical practice. This will include both the perspective of the effects on human tissues and on the oral bacteria. A more comprehensive guide to the field of molecular biology should be sought elsewhere.

The microscopes of Van Leeuwenhoek opened our understanding of a previously invisible world, which led to many advances in science and technology benefiting mankind. As the disciplines of chemistry and physics developed, more powerful tools became available to look more deeply into the biological world. Beyond the outlines of single cells and into the workings of intracellular metabolism. Perhaps the pinnacle of this chapter in history was the discovery of DNA, the code of life in the 1950's. It is instructive to touch on some of these technologies and how they assist in the understanding and treatment of dental diseases.

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Advanced Light Source Laboratory at UC Berkeley.

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Dentin growth and remineralization

"…a systematic respect for the original tissues…"
– even when the tissues are infected.

Dentin heals:

- Remineralization from external sources (Fluoride, SDF, minerals in saliva)
- Mineralization and dentinogenesis via odontoblasts
  - Intertubular dentin
  - Peritubular dentin
  - Circumpulpal dentin

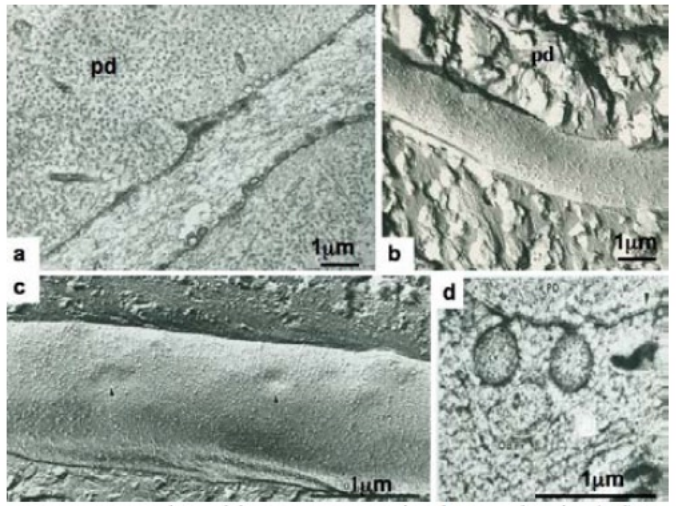

Figure 10. Odontoblast processes in the predentin (pd) A and D. TEM, B and C. Freeze fracture replica. In C, arrowheads indicate membrane sites where endocytosis is initiated. In D, coated vesicles (cv) seen on ultrathin sections are implicated in the re-internalization of spliced molecules.

Michel Goldberg, Askok B. Kulkarni, Marian Young, Adele Boskey. Dentin: structure, composition and mineralization. *Front. Biosci. (Elite Ed)* **2011**, 3(2), 711–735. https://doi.org/10.2741/E281

- https://www.imrpress.com/journal/FBE/3/2/10.2741/e281

References for Incomplete/Selective Caries Removal

- ***"The removal of infected dentin is not fundamental for caries arrest"***

  (Chibinski et al, Pediatr. Den. **2013**)

- ***"Removing all vestiges of infected dentin is not required for caries management"***

  (Thompson, et at, JADA **2008**)

- ***"There is a clinical advantage to leaving caries partially unexcavated"***

  (Ricketts et al, Cochrane Review **2013**)

- ***"Bacterially contaminated or de-mineralized decay close to the pulp does not need to be removed"*** (Schwendicke, et al, Advances in Dent Res, **2016**)

- ***"…complete caries removal technique is no longer recommended…"***

(Innes, Frencken et al Advances in Dent Res, **2016)**

Slide courtesy of Dr. John Frachella

2016 Consensus paper on layers in lesions says to:

"Remove nothing in the leathery dentin zone"

(Schwendicke, Frencken, Fontana, Lo, Zandona, Innes Managing Carious Lesions: Consensus Recommendations on Carious Tissue Removal Adv Dent Res., 2016)

Slide courtesy of Dr. John Frachella

Incomplete Caries Removal:

- **In 2013 : 8 Cochrane Review RCTs**
- **In 2021: 27 Cochrane Review RCTs**
  - 3,350 participants, 4,195 teeth in 11 different countries

"The probability of failure is greatest with complete caries removal in deep lesions"

- Nicola Innes

Slide courtesy of Dr. John Frachella

Hall Crowns more successful than conventional restorations

- 2-year randomized control trial
- 116 children with caries in primary molars

Treatment group	Clinical Success rate over 2yrs	Low/no pain reported
Hall Crowns (**no caries removal**)	93.8%	88.6%
Conventional Restorations	60.8%	92.3%
Non-Restorative Caries Treatment (SDF and making cleansable)	42.5%	77.1%

Julija Narbutaite , Ruth M. Santamar´ ıa , Nicola Innes , Christian H. Splieth , Vita Maciulskiene , Comparison of Three Management Approaches for Dental Caries in Primary Molars: A Two-Year Randomized Clinical Trial, Journal of Dentistry (2024), doi: https://doi.org/10.1016/j.jdent.2024.105390
https://pubmed.ncbi.nlm.nih.gov/39374732/

Hall Crowns are superior to conventional restorations

Julija Narbutaite , Ruth M. Santamar´ ıa , Nicola Innes , Christian H. Splieth ,Vita Maciulskiene , Comparison of Three Management Approaches for Dental Caries in Primary Molars: A Two-Year Randomized Clinical Trial, Journal of Dentistry (2024), doi: https://doi.org/10.1016/j.jdent.2024.105390

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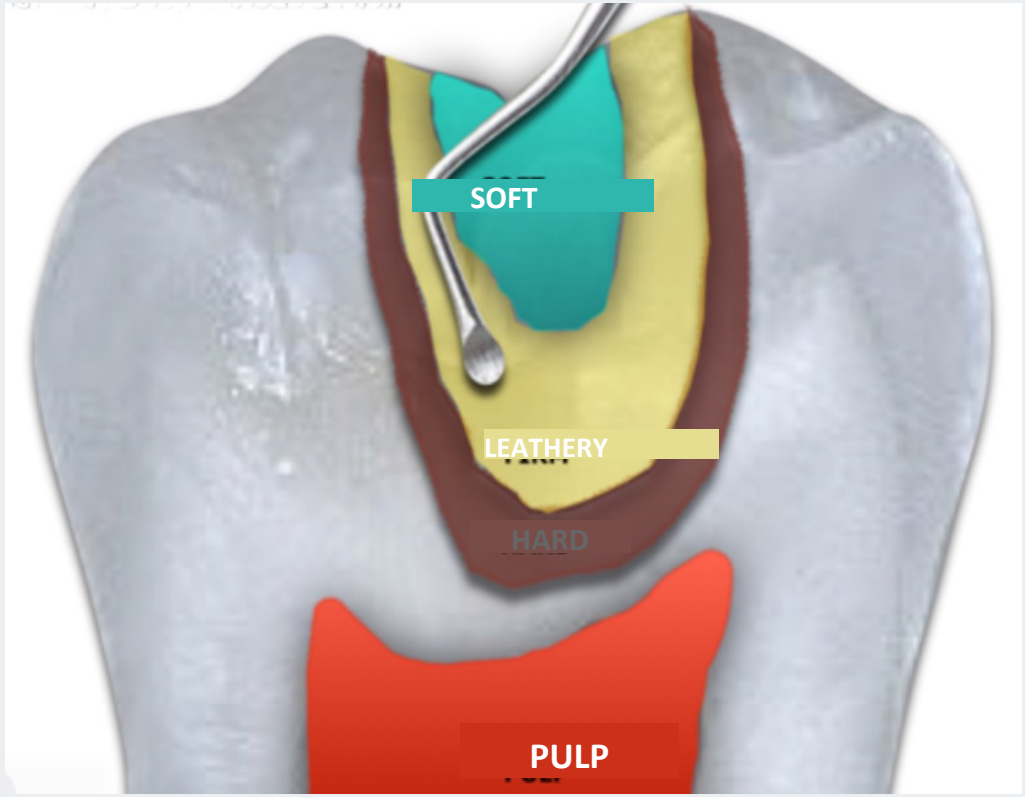
Slide courtesy of Dr. John Frachella

“Leathery Dentin” should be left intact and remineralized

- Neel, et al, Demineralization–remineralization dynamics in teeth and bone, Int J Nanomedicine, 2016; 11: 4743–4763.

-Arifa, et al, Recent Advances in Dental Hard Tissue Remineralization: A Review of Literature, Int J Clin Pediatr Dent, 2019 Mar-Apr; 12(2): 139–144.



Courtesy of Dr. Meenakashi Kehr

Slide courtesy of Dr. John Frachella

Case Presentation:
Dr. Matthew Wolpert

Sophie Trettevick Indian Health Center

(Makah Tribe)

Neah Bay, WA

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Case presentation by Dr. Matthew Wolpert

- 9-year-old presents with deep caries #30

Initial lesion

Case presentation by Dr. Matthew Wolpert

- 9-year-old with deep caries #30

<u>Treatment provided</u>

- SDF treatment of lesion (2x)
  - Pumice to clean
  - Desiccated prior to SDF application
- Fuji IX restoration placed
  - **No** local anesthetic
  - **No** excavation/drilling
  - Conditioner (PAA used)
- This is called a **SMART**

  (Silver Modified Atraumatic Restorative Treatment)

Initial lesion

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Initial lesion

SDF + Fuji IX after 18 months

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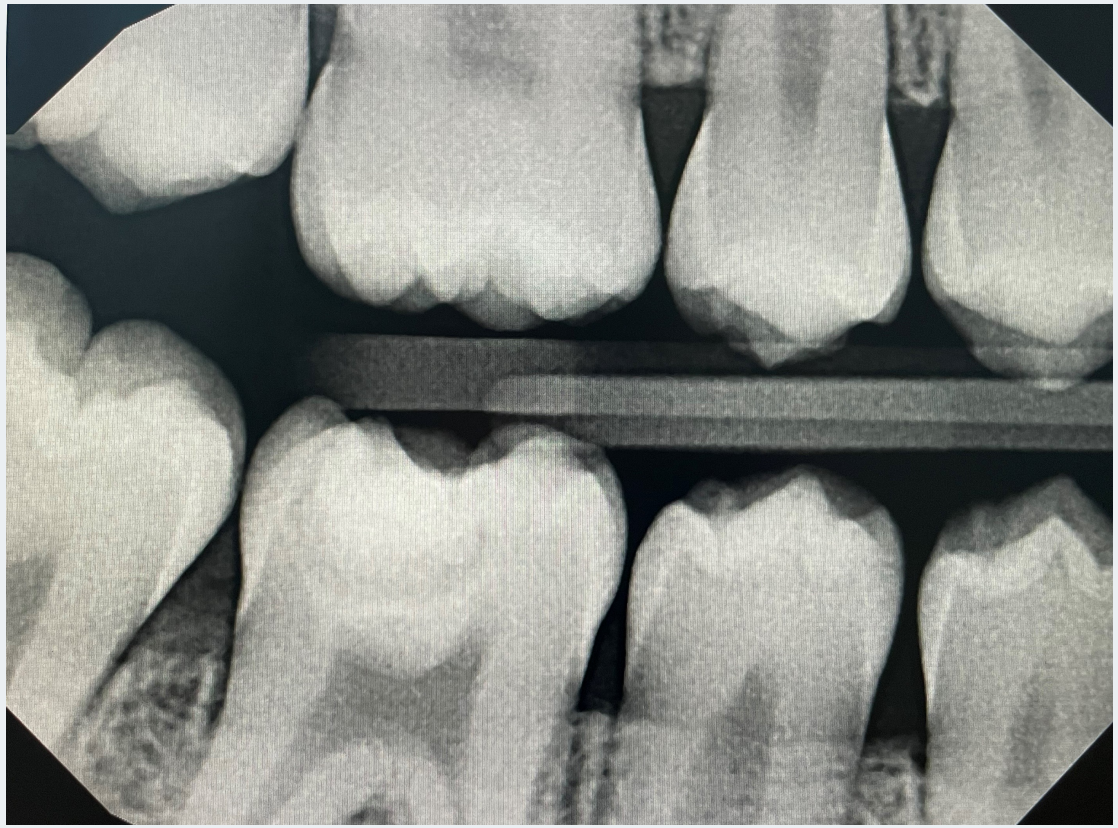
18 months follow-up (age 11):

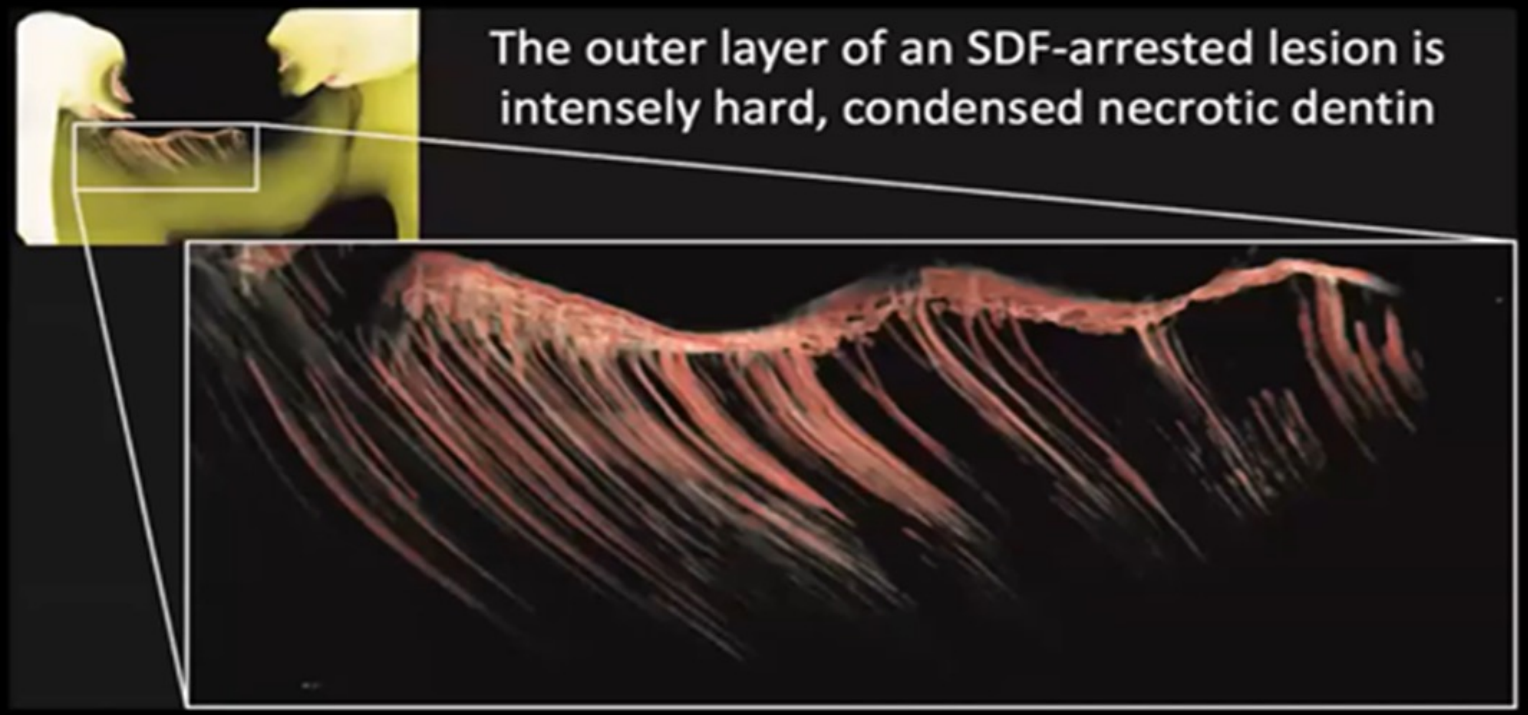
- Vital
- Asymptomatic
- Lesion is arrested
- Fuji IX crumbling/loose



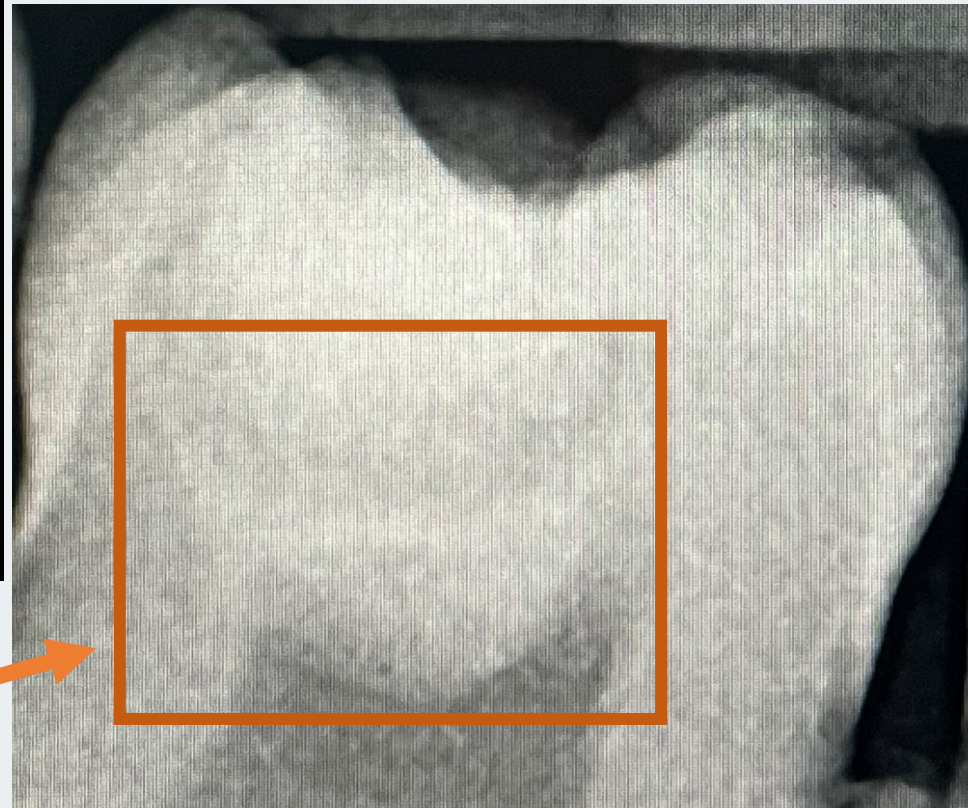
SDF + Fuji IX after 18 months

SDF + Fuji IX
after 18 months

SDF hardens carious dentin



Seto, Horst, Frachella, Duffin, MacLean



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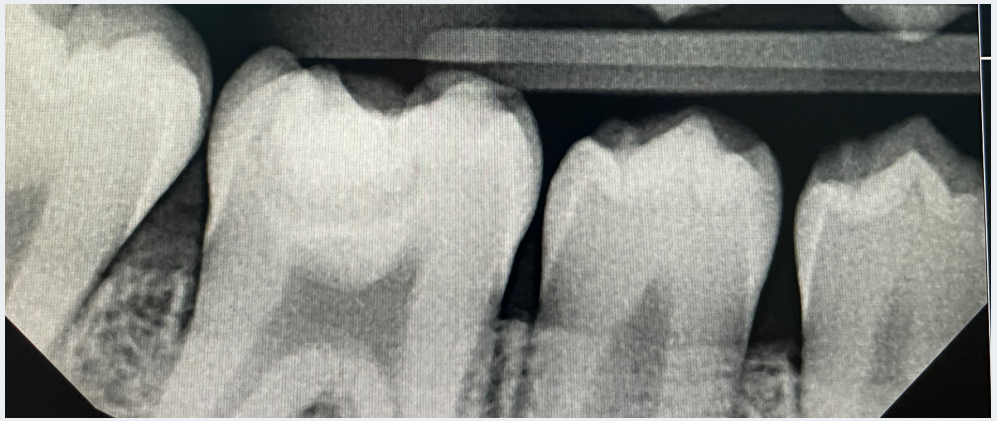
SDF + Fuji IX after 18 months



Resin restoration

New restoration placed:

- **No anesthetic**
- Margins prepped
  - Mild sensitivity
- Resin restoration
  - Optibond FL System
  - Filtek Flowable (layered)

Resin restoration

#30 Restored

- Atraumatic
- Selective caries removal
- Good prognosis
- Happy patient!

Dr. Matthew Wolpert
wolpertdmd@gmail.com

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(Summarized)

Case Presentation:

Dr. Taylor Wilkens

Marimn Health & Wellness Center
(Coeur D'Alene Tribe)

Plummer, ID

(detailed case presented during

January 2024 Oral Health ECHO)

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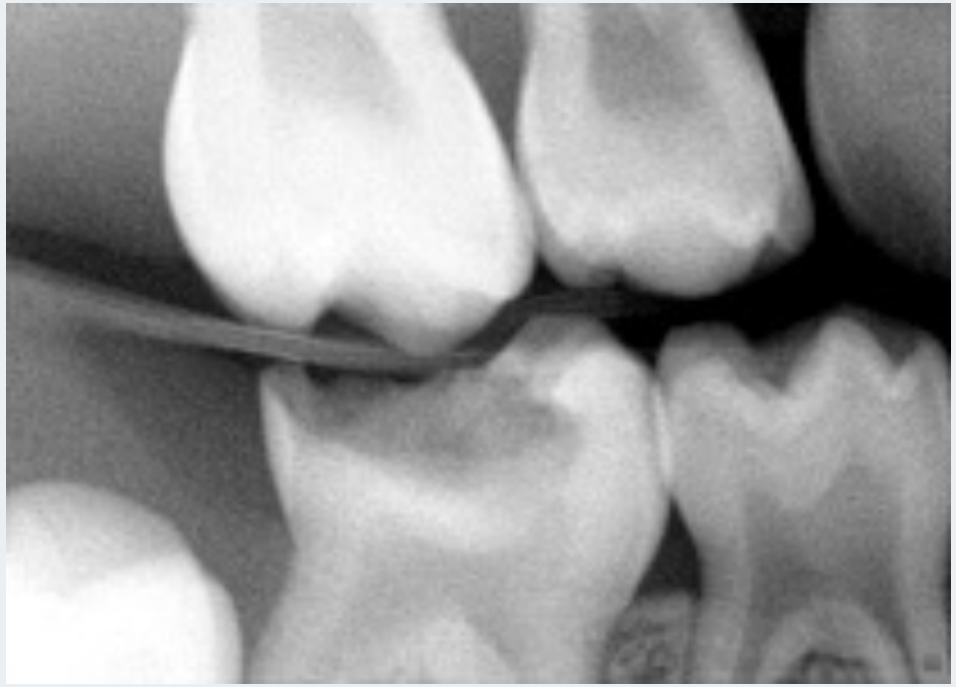
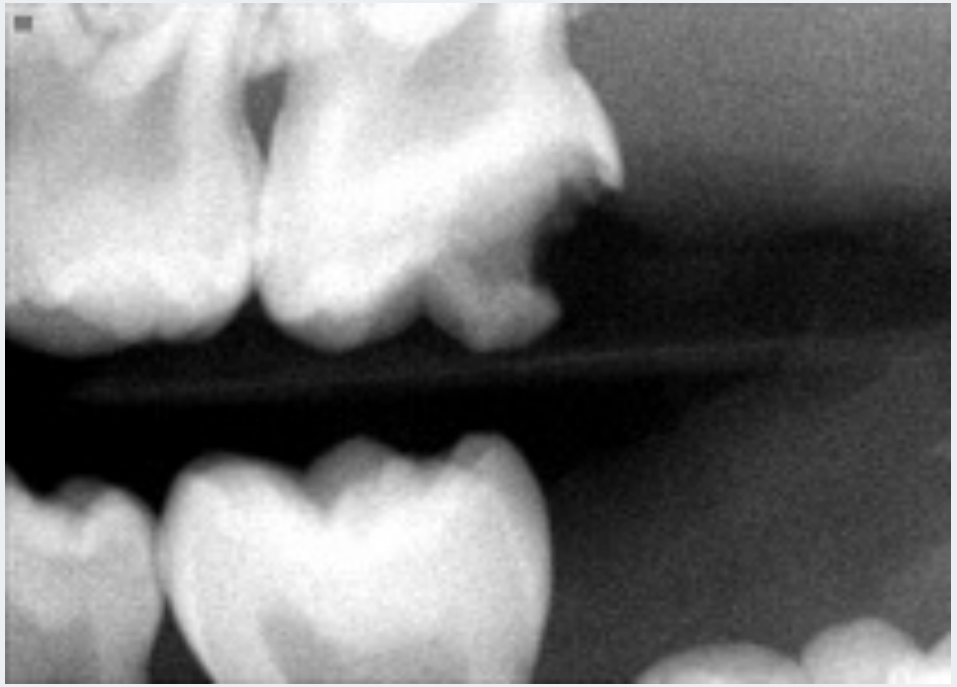
5-year-old with deep caries #J and #T – April 2019





Clinical Findings:

- No history of pain
- No sign of infection

Goals Of Treatment:

- Positive experience for the patient.
- Maintain 2nd primary molars as long as possible.

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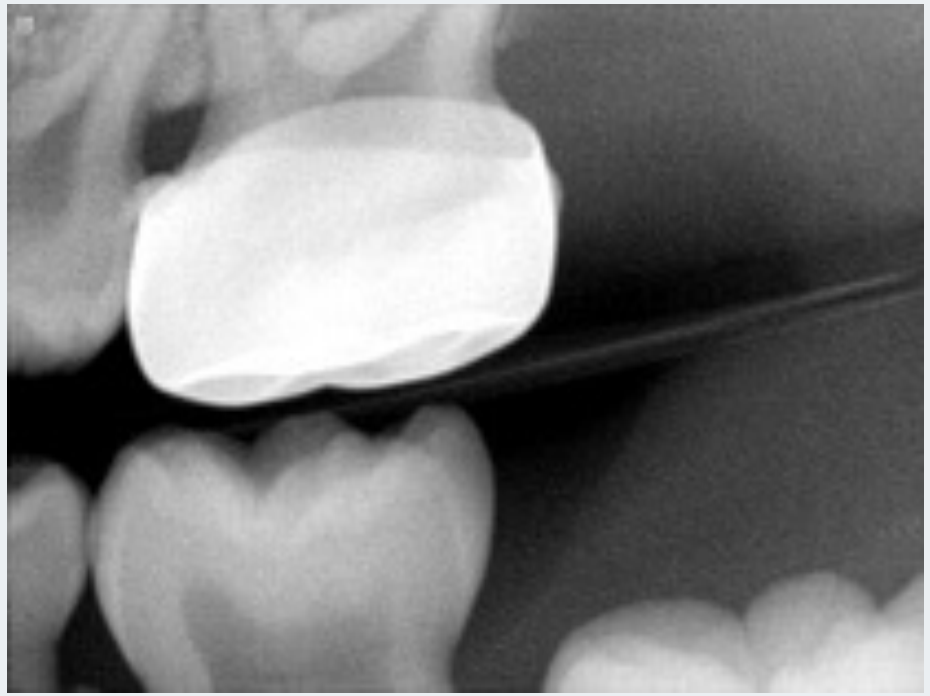
Treatment – May 2019

- Removed spacers, size 3 Isoform SSC fitted
- Spoon excavation of soft decay and applied SDF
- Cemented crowns with Fuji 9
- Patient left smiling and laughing!

Postop #J/T



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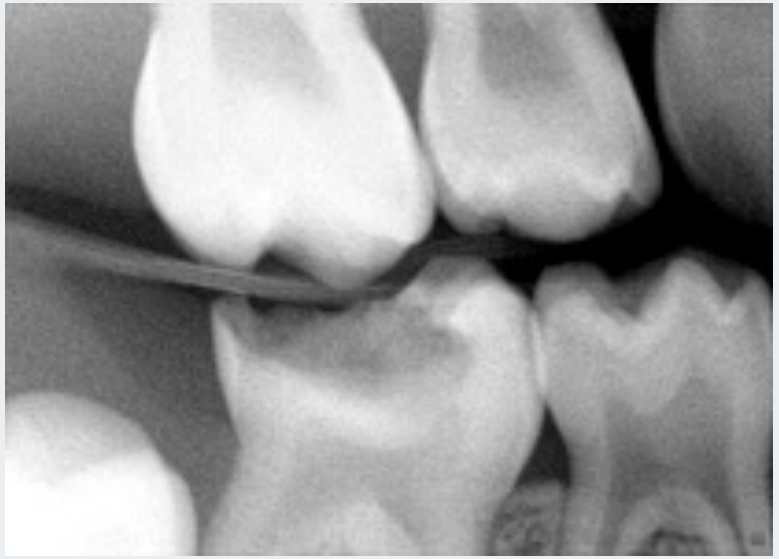
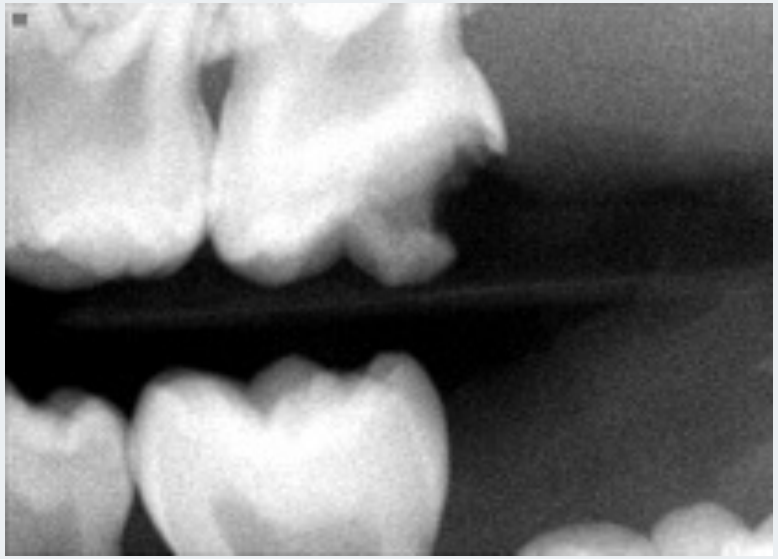
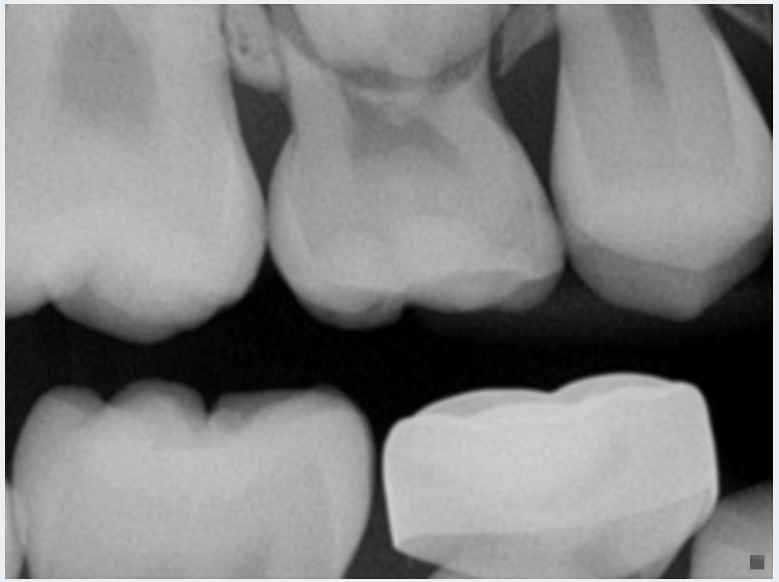
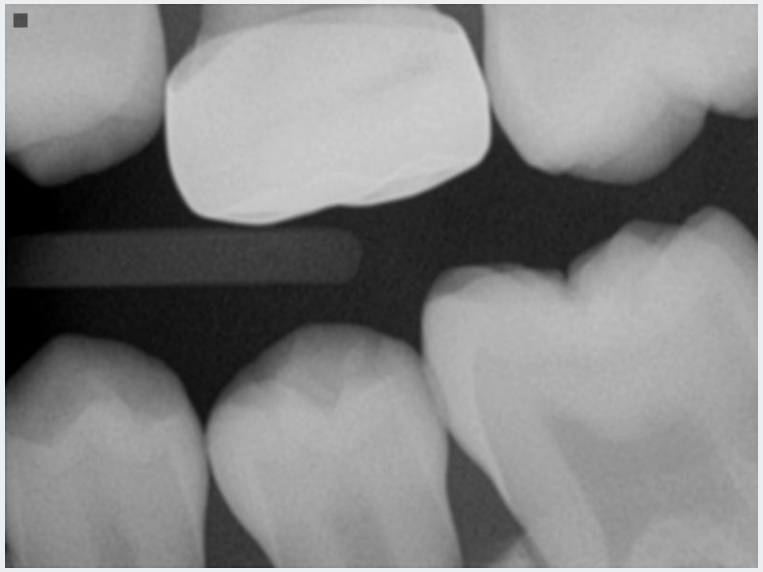
April 2019





December 2023





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Key Messages:

- Leave as much natural tooth structure intact as possible, including infected and affected (leathery) dentin
- Dentin remineralizes/heals if caries are sealed
- A **strong circumferential seal** is the key to arresting caries
  - Many restorative materials with good technique and environment can produce this seal

Recommendations:

- SDF to prior to restoration (SMART) when possible/practical:
  - Arrests caries
  - Reduces sensitivity during treatment

- Glass Ionomer restorative/liner:
  - Releases minerals to remineralize lesion
  - Seals margins with chemical seal (zone of fusion)

Group Discussion and Q & A

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Questions?

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Dr. Sean Kelly: drkelly55@gmail.com
Dr. Miranda Davis: mdavis@npaihb.org

Thank You!

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