Minimally Invasive Dentistry and the Medical Management of Caries

PNW Tribes

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Available on Amazon

Dear SMART Coauthor:

As I"ve been living through and thinking about the present Covid 19 pandemic, I keep returning to our book Smart Oral Health. Thank you for your contribution. What will our profession look like as we return to patient care ? How will we control the issue of aerosols in our working environment?

The messages of minimally invasive and effective patient care as described in the numerous chapters of the SMART book makes it possible to treat caries using SDF and GIC without causing aerosols anywhere on earth, even a dental operatory. I have done this on a beach at the Island of the Sun in Lake Titicaca. And in the middle of the road in West Africa.

While we finished the SMART book before anyone had heard of Covid 19, I believe that it is a road map that can instruct our profession on how to make it through this crises and how to modify our activities once we are on the other side.

We have not done any formal marketing of the book so sales are small. Please share with me any ideas that you have to help promote this timely and important message out to our profession.

www.smartoralhealth.com

I will devote 100% of my personal royalties from the book to support the schools that are described as our pilot sites. The short video below highlights the school in Ghana.

Sincerely,
Steve Duffin
Dental Director
NoDK, LLC
Oral Health Outreach, LLC

Disclosures

- I have not and will never make any income from the textbook, I am merely one of many authors.

- In the past, I've been paid to speak by Elevate Oral Care (makers of Advantage Attest SDF)and GC America (makers of Fuji glass-ionomer materials) but am not being paid by them or anyone else for this presentation.

Why MMC/MID/SMART today?

"The new paradigm of dentistry is non-restorative caries treatment".

(ADA, 2018)

A **higher, ADA-supported standard of dental care is** to **"leave caries in the tooth"** with or without a restoration.

MMC/MID control caries and SMART restore definitively without microbial aerosol.

Just in from the ADA

- The COVID-19 crisis has closed dental offices across the globe except for emergencies and urgent treatment. During this time, the American Dental Association has provided guidance on what is considered emergency and urgent care, and asks clinicians to use their professional judgment when determining if and what treatment is needed. Silver Diamine Fluoride is listed among the treatment options for urgent care.

USA Today Dec 2019

- On December 18th, 2019, USA Today published an article discussing the top 15 health news updates of the decade. Mixed in among cancer treatments, gene editing, and 3D printing human organs was listed a new treatment of tooth decay: Silver Diamine Fluoride 38%.

FiCTION Randomized Clinical Trial Results

The study compared three treatment options with one another with interesting results:

(1) conventional with best-practice prevention (local anesthetic, carious tissue removal, filling placement)

(2) biological with best-practice prevention (sealing-in decay, selective carious tissue removal and fissure sealants) and

(3) best-practice prevention alone (dietary and tooth-brushing advice, topical fluoride and fissure sealing of permanent teeth)

The results :"There was no evidence of an overall difference between the three treatment approaches for experience of, or number of episodes of, dental pain or dental sepsis or both over the follow-up period" supporting the benefits of preventive products in controlling and treating tooth decay.

A publication in the Journal of Dental Research

Reviewed how different methods of communication with patients can result in reduced caries rates, discussing how Motivational Interviewing can impact patients' health.

In the control group, 61% of patients developed new lesions, and in the test group, only 44% developed new lesions.

The article concludes, "Training in and implementation of a motivational interviewing–informed brief intervention provides opportunities for dental nurses to facilitate behavior change improving the oral health of children at high caries risk."

Corona Virus

- MMC/MID/SMART were important changes in the delivery of dental care worldwide before C-19 but the pandemic has made MMC/MID/SMART even more important to understand and to adopt for all patients in all socioeconomic strata because they desensitize, arrest, are antibacterial and re-mineralize-ing and **can be delivered aerosol-free**

Can SDF applications and SMART be lucrative?

-For over a decade before C-19 hit, very large and successful private practices were providing MMC/MID/SMART for patients among all socioeconomic strata as a first measure to control caries at higher levels of profits than they previously made providing traditional D+F dentistry :

-Two in OR: pedo/ortho practices (Quas) and a general practice (Duffin)

-One in AZ : private pedo practice (Maclean)

- One in SD: private general practice (Hull)

- One in PA: private general practice (Parrot)

-One in WI : pedo practice (Kammer)

Before we get started:

Don’t take anything our of your tool kit

That stuff and the skills to use it can be re-purposed

This is about re-sequencing what we learned in dental school

and what we may think we know about protocols and materials that heal teeth

Minimally Invasive Dentistry **is not…**

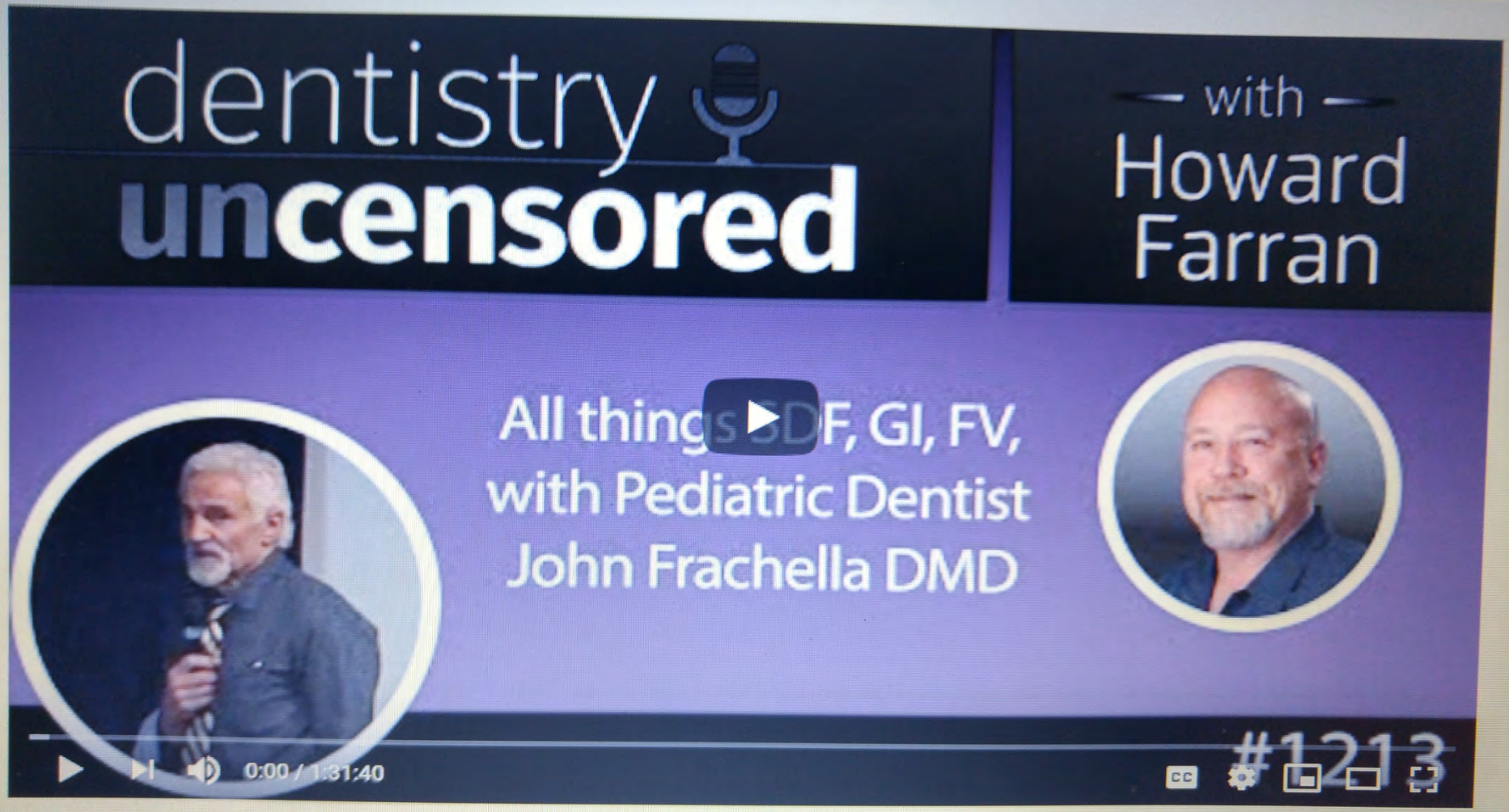
..something developed for dentists with poor technical abilities –

It's for practitioners who are finally placing thier pathet's best interests above all else

“Are we dental healers or dental wheeler dealers?”

SDF, GI, FV with Pediatric Dentist John Frachella, DMD

Dentistry Uncensored with Howard Farran # 1213



The main message of MID/MMC:

“ BE A FIREMAN FIRST”

Putting out the “FIRE” controls the disease that dentists are primarily charged with addressing so more comprehensive dental care can be provided later when…

TIME, MONEY and BEHAVIOR align

For example:

Providing space maintainers, pretty composite fillings, orthodontics and implants FIRST… is backwards

When we treat the disease of caries before treating its symptoms:

1) More patients can be treated per day with far less stress on dentists and staff.

2) More profits accumulate at day's end due to increased number of patients treated per day.

3) Fewer emergencies arise giving us more time to do what we want to do because caries is controlled.

4) Patients are happier and want to return

The easiest and most affordable way to PUT OUT THE FIRE in any patient population is to start with…

SDF

-It's not the end all/be all

-It's not a panacea

-It's not for every patient

But it is the place to start when putting out a fire

SDF - what is it?

Clear Blue liquid

25% silver: antimicrobial

8% ammonia: solvent

5% fluoride: remineralization

Advantage Arrest from Elevate
70 Cents a drop

$174.95 = 8 mL bottle = 250 drops = $0.70/Drop

Made in USA

.

Riva Star from SDI

-$10 per application

-pH=13

-Can create burns

-Sill stains despite claims to the contrary,

- Needles and drills recommended

Dr. Jeanette MacLean just got kicked off of a webinar for saying this today: I see actions like these as examples of corporate greed and protection of marketing turf.

But **<u>the science doesn't lie.</u>**

Please beware:

- The Riva Star dentist researchers (Drs Graham Craig and Geoff Knight) are friends from Australia and colleagues of our team (Duffin, Maclean, Horst, Young, Frachella).

- We all represent ourselves, not the manufacturers of products.
-
- The products we suggest using are not always available in other countries. For example, Advantage Arrest SDF is not available in Australia.

- Henry Schein sells “Riva Star” in the US. but does not sell “Advantage Arrest” . Schein is a huge corporation, Elevate, the manufacturer of Advantage Arrest, is a tiny company. When controversies arise, please consider which medicines are safe and effective to use on your patients and which suppliers have the deepest pockets to buy advertizing blitzes .

Recent questions from dentists:

I'd like to get these out of the way before going on

-Why GIC vs. Cavit as a temp material?

-Because GIC is biologically active and Cavit is inert thus Cavit does not provides anti-bacterial or re-mineralizing activity and GIC and RMGI do. Also, Cavit does not permanently seal lesions and GIC and RMGI do.

-Who can legally apply SDF?

-SDF is a topical fluoride and can be applied by anyone who can apply FV.

Can we send SDF to people's houses to self-apply with instructions as a teledentistry intervention?

- There's no law that says we can't instruct patients to apply their own SDF but it's probably not a good idea because SDF stains countertops if spilled and if it stains caries in adjacent teeth to ones being treated, patients could freak out and seek legal recourse against us.

Is Activa better to use than glass-ionomers?

Activa is 90% resin and does not have any advantage over other resins which have zero bioactivity with tooth structures.

RMGIs (like Fuji II LC) have 80% GIC/20% resin and are proven to have the same sealing, re-min and anti-bacterial properties as pure GICs

(Later in this lecture series we will review studies and SEM images that support this)

How can dentists provide caries control over the phone during the lock down:

1) Call and send them to a pharmacy for 5000PPM Rx t-paste with instructions to use it instead of regular paste, no rinsing after brushing and floss after brushing before bedtime.

2) Refer patients to newenamel.com for free risk assessment so they can order a kit of FV and/or 5000ppm t-paste and have it delivered to their house, however the company will not deliver SDF .

3) Provide patient motivational phone interviews to help them establish better home care and/or to change their caries-causing dietary habits by recommending “replacement therapy”

(i.e. replace sour gummies or crackers+chips with chocolate and nuts for snacking)

A practice tip: Sell tubes of Rx 5000ppm in your office directly to patients

- Avoids time consuming script signing and phone calls to pharmacies

- Gets the medication to the patient immediately

- Reduces everyone's carbon footprint – no need to drive

- Costs 1/3 of what pharmacies charge per tube if you charge your cost + shipping + 10% profit.

- It'd be a value added feature of your practice in a convenient one-stop shopping way that patients will appreciate

OK, lets get back on track with MMC/MID/SMART

Materials for MMC/MID/SMART

- Do NOT take the word of manufacturer's and dental supply house representatives about bioactive materials even if they take you out to lunch and buy you beers.

We cannot outperform GIC as a bioactive material

-Nothing on earth is more tooth-like than glass because all the mineral ions in glass are also in teeth: calcium, potassium, fluoride, even strontium and aluminum.

-You already know that moist-field mineral ion transfer from topical fluorides can change vulnerable hydroxyapatite to acid-resistant fluoroapatite which is called “re-mineralization” which is why we use FV.

- Glass-ionomers and SDF do the same mineral ion transferring only much more powerfully, quickly and effectively than do topical fluorides like NF, APF or FV.

- Resin composite cannot re-mineralize because it contains zero mineral ions. Glass ionomer is what coats artificial joints when we get knee and hip replacements because glass bonds permanently to bones . Resin used to be used but not any longer because resin does not bond chemically, bioactively or permanently to bone (or to teeth) the way glass does.

SDF - what does it do?

- Detects caries

- Arrests caries

- Prevents caries
  - *directly & indirectly*

- Decreases hypersensitivity

SDF is a medicine

-Like any other medicine SDF needs to be reapplied, sometimes many times/year especially in very high risk patients.

-In mild risk patients, apply 2X/yr (q 6mo).

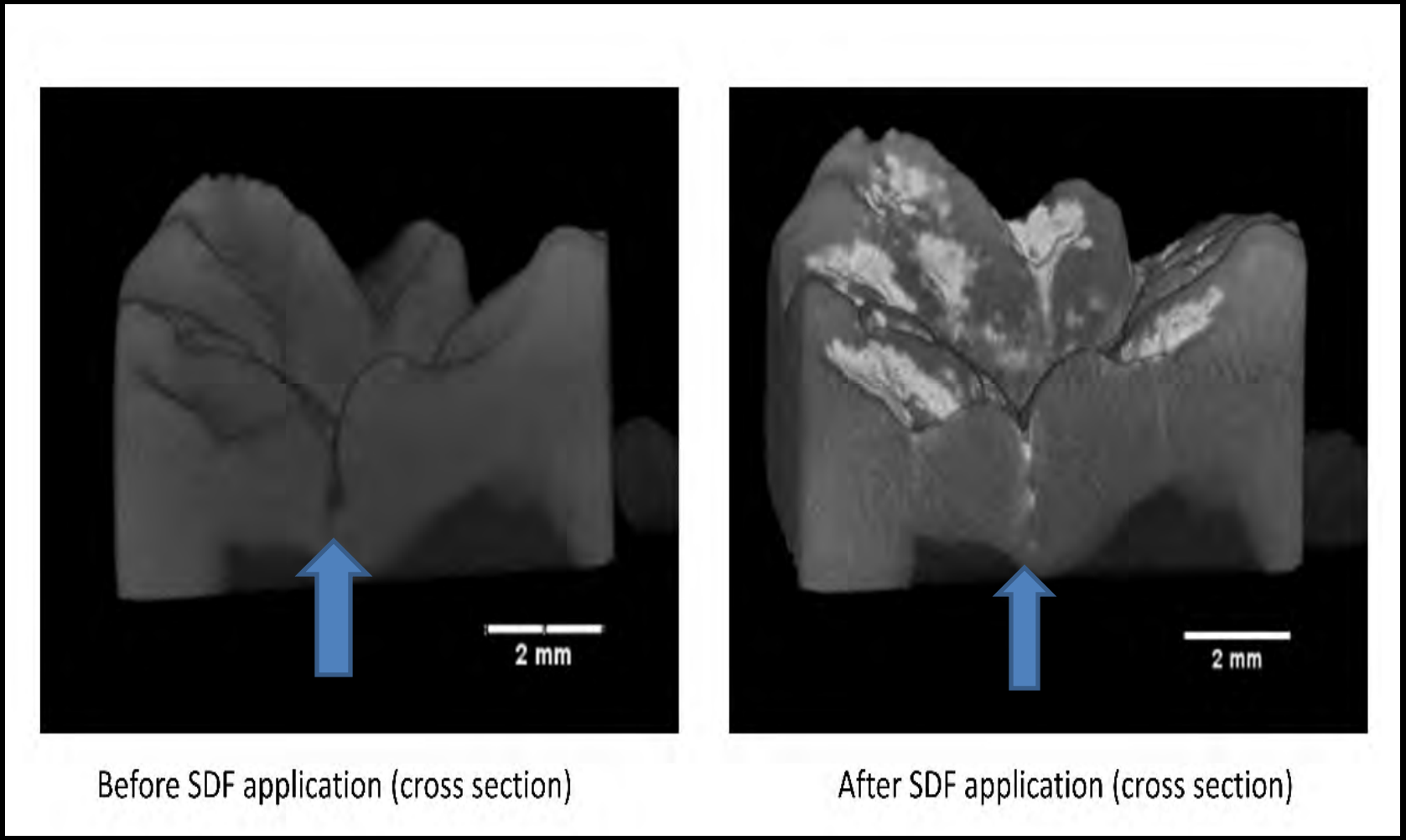
- In some cases it may take 1.5-2 years to get full caries arrest with SDF.

- Maintenance doses are very much more effective than JUST one or two applications.

Pre and Post Treatment of healthy teeth with SDF

Minimal to No Staining

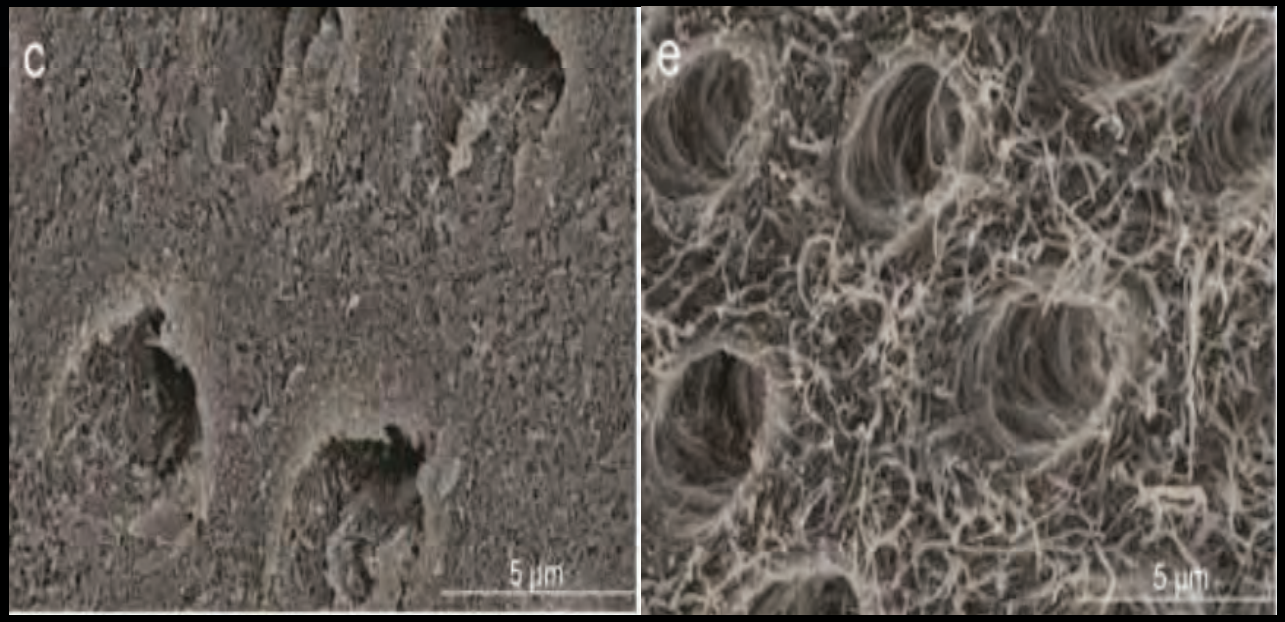
3-D CT-scan Shows Silver Sealing Fissures



Courtesy Dr. Edward Lo, U Hong Kong

Arrest of Dentinal Lesions

Dentin slab demineralized and treated with 38% SDF*



Treated Control

*Courtesy Edward Lo, U Hong Kong

SDF:
Extremely effective for older adults

SDF Prevents Caries

For prevention, target susceptible surfaces:

-Occl and buccal surfaces of all posterior teeth

and on

-All exposed root surfaces

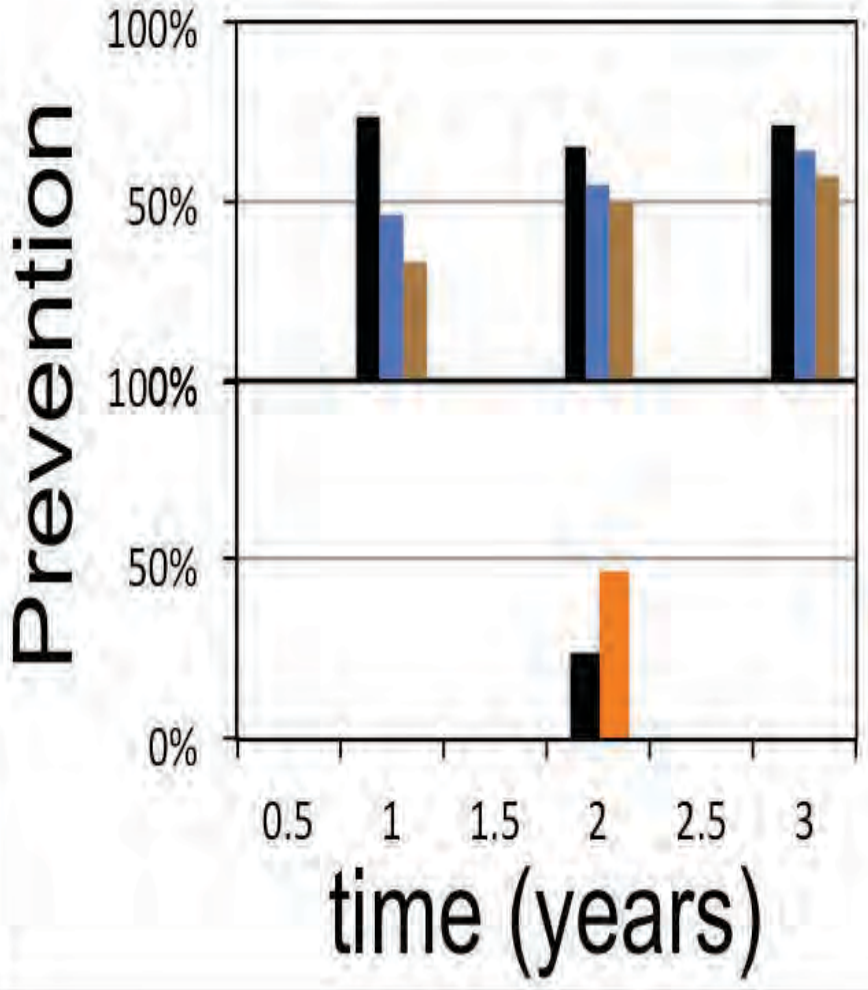
SDF Prevention of Root Caries in Elders (N=306)

Fewer new lesions with SDF vs. Varnish at 3 years of follow-up.

Prevented Fraction = 71%.

Dent Research 2010;89:1086-1090

Prevention of Root Caries
SDF q 6 mos most effective



SDF q1year
NaF q3mon
Chlorhex q3mon

Tan *et al.*, 2010
203 79 year olds
control: 2.5 new lesions

SDF q1year
+ OHI q6mon

Zhang *et al.*, 2013
227 60-89 year olds
control: 1.3 new lesions

73 yo patient
For years his brushing was unsatisfactory.

Photos courtesy of Dr. Thierry Boulanger, Brussels

SDF on cervical lesions, he doesn't care about remaining stains.
After repeated SDF applications his gingival health improved
without changing brushing habits or diet

"I'm convinced that SDF improves the cervical hygiene and gingival health." Dr. T. Boulanger, Belgium

He’s fine with the aesthetics, no sensitivity, caries under control, gums are healthy and he returns every 3 months for **maintenance doses of SDF as a medicine**

Radiation Treated Oral Cancer survivor, SDF-arrested caries, 3 year follow-up

SDF to avoid hospital GA – stain can be addressed aesthetically later when time, money and behavior allow

GD's daughter, 6+YO, GD afraid to drill her, so he called and I told him over phone to do this:

He applied SDF 4X: in these images she's 4 mos post- op.

These stains don’t show when she smiles

They can be made white when time and behavior allow with MID and by using resin or glass-ionomer opaquers

Let’ see a simple one surface Multi Day SMART (SDF+GIC)

4yo, SDF 2X

RMGI (Fuji II, LC) applied, then bonding agent applied on microbrush, for gloss then light cured

One month post-op

Protocol for one surface Multiple Day SMART

1) Ask patients to brush @ home night before + day of each SDF and/or SMART apt.
2) Apply SDF 2X before SMART apt: dry and clean as much plaque as possible from lesion with end of cotton roll, apply SDF with stiff microbrush for 1-3 min using scrubbing action, then apply FV to protect SDF from immediate dilution with saliva and to mask SDF taste, then dismiss patient until next SDF application apt.
3) Just before SMART apt, patient swishes with warm water in office, then spits.
4) Carefully remove any loose plaque with cotton pellet or, end of cotton roll and carefully run explorer through fissures to clean them if necessary.
5) Use no compressed air or water, disrupt as little plaque as possibe.
6) Must apply PAA conditioner with microbrush for 10-20 sec with scrubbing motion, then "rinse" with wet cotton, then dab with dry cotton LEAVING TOOTH SURFACES MOIST
7) Apply GIC or RMGI directly to SDF-moist lesion using thin smear of Vaseline on instruments and/or gloved finger so material doesn't lift from lesion.
8) AVOID CONTAMINATING ANY YET UNTREATED LESIONS WITH VASELINE.
9) Have patient bite to establish occlusion, then remove excess material with cotton tip applicator, scaler or explorer: DO NOT DISTURB MATERIAL AFTER INITIAL SET (when gloss on material's surface turns to a matte finish.
10) If GIC, give instructions of soft diet for 3 days, no popcorn.
11) If RMGI, light cure and done.

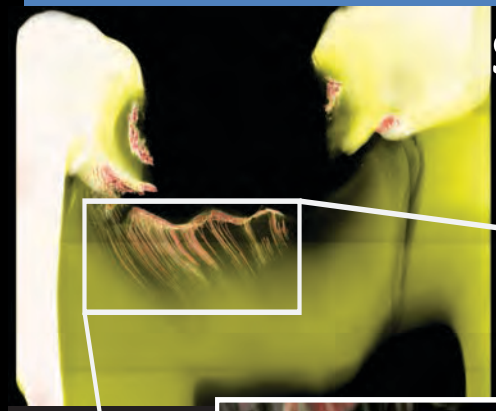
Does SDF affect bond strength?

-Studies show zero effect of SDF on glass-ionomer bond even when SDF is not rinsed off before glass-ionomer application.

-Studies show resin bond strength decreases if don't rinse SDF off (thus diluting it) before resin application.

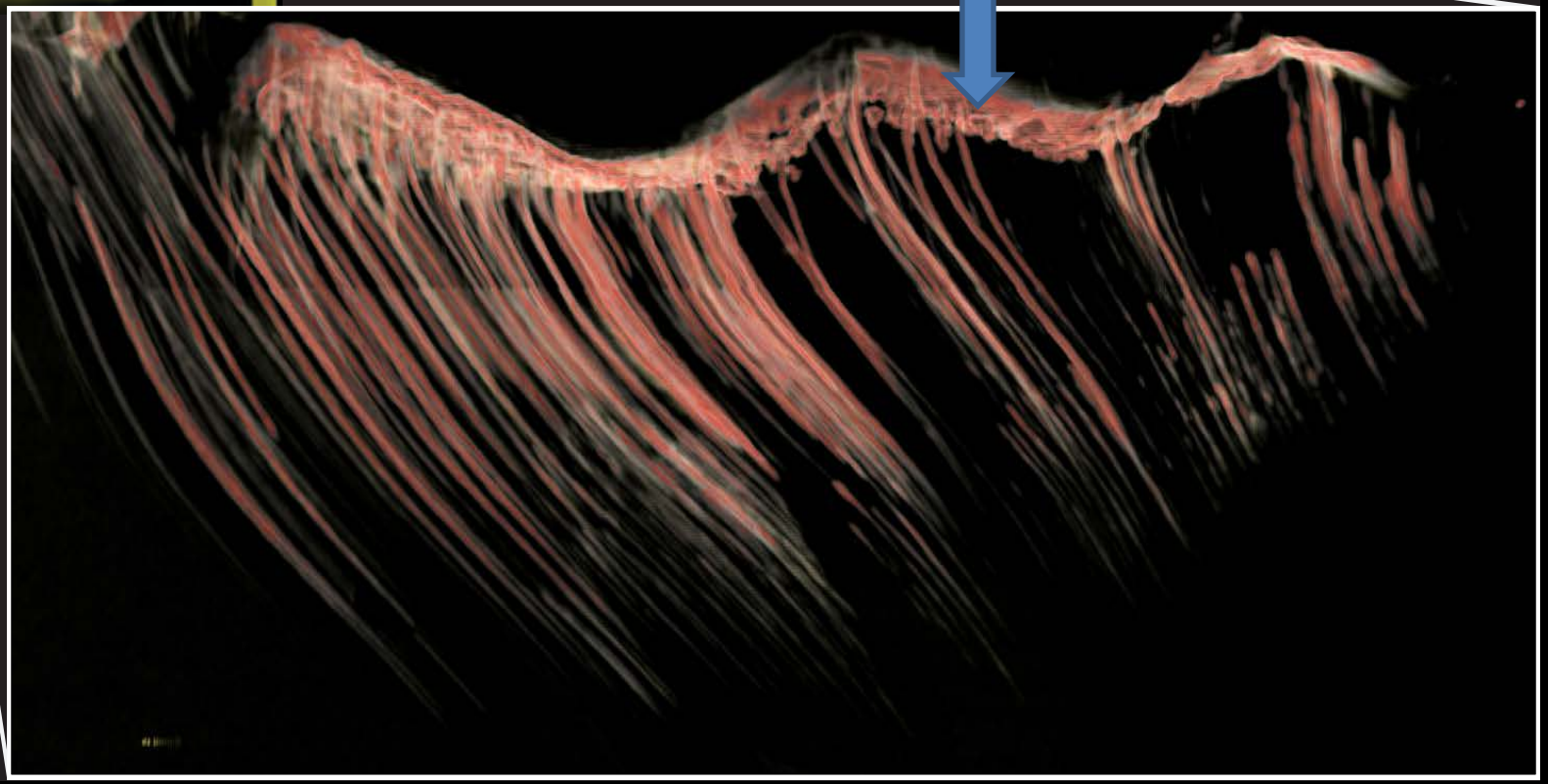
What does SDF actually look like inside dentinal tubules?

Image of exfoliated primary molar treated with SDF only. Silver (seen here in pink) penetrated and occluded open dentinal tubules

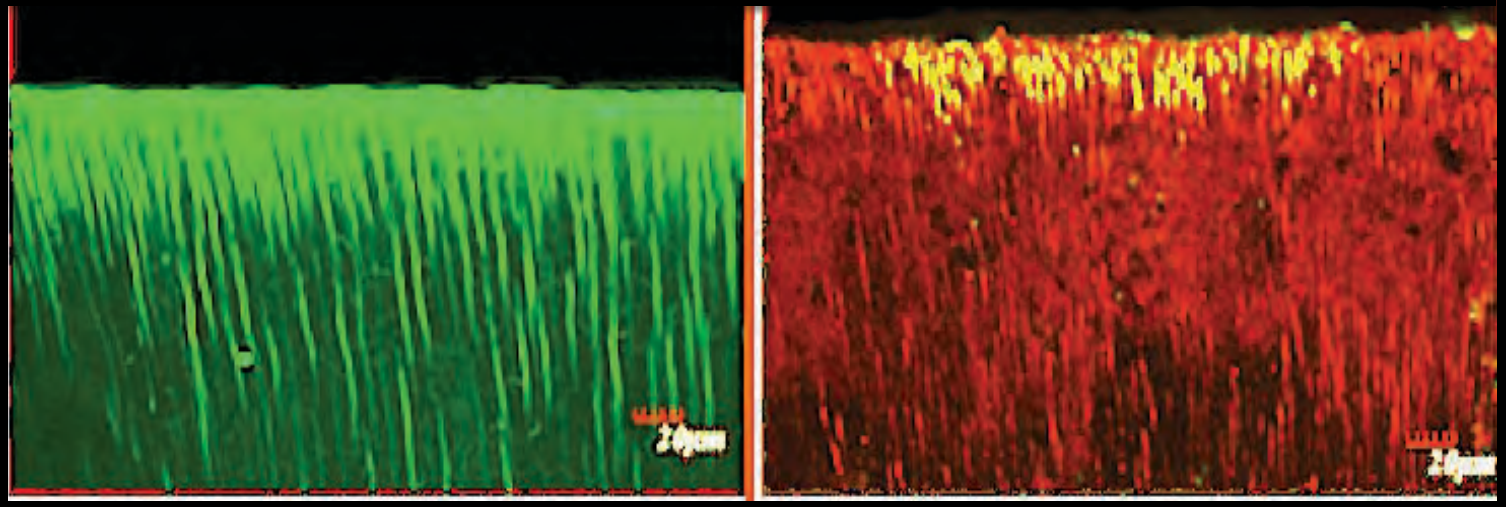


SDF Scaffold" of structural support for restoration.

SDF-treated dentin is 2X as hard as normal dentin



Antimicrobial Effects seen with SDF inside dentin tubules



Lawn of **Mutans growing** on human dentin disks

Mutans dead after SDF

-Silver is inhibitory of plaque biofilms inside dentin

-SDF= pH 10 even when it's sealed inside a lesion.

-Caries occurs at approx. pH 6.6

- Caries is primarily a pH-mediated disease

Silver microwires in tubules can be seen with the naked eye under GIC in this SMART

2017 Paper on Silver Microwires

"Silver microwires from treating tooth decay with SDF"

Seto, Horst, Parkinson, Frachella,JDeRisi, doi: https://doi.org/10.1101/152199

-"SDF stops 81% of cavitated lesions."

-"SDF-treated lesions harden and become resistant to further decay. We hypothesize that the hardening is due to a tooth's reaction with silver…"

More from Silver Microwire paper….

-Silver microwires 25-500 micrometers long and 0.25-7.0 µm in diameter are cast *in situ* in dentinal tubules

-Microwires are observed down to 700 µm expanding throughout dentinal tubules that were broken down by the caries process.

-The microwires may provide a reservoir of silver for antimicrobial action and to prevent fluid flow through tubules, and increase hardness of the lesion.

-Hardness could arise from microwires distributing forces throughout the lesion and into intact dentin. Fluid flow in tubules causes pain. SDF clinically decreases sensitivity.

SDF on Anterior teeth?

If there's de-mineralization or
hypo-mineralization,
SDF will stain front teeth black…

But the SDF stain can be masked and the teeth can be made white later when TIME, MONEY AND BEHAVIOR ALLOW

Here's Claire, a confirmed dental phobic" : at age 2 she had <u>SDF 2X</u> on her **centrals and laterals**
This is a pic of the staining at age 4.
Her mom is an orthomolecular biologist at UW and did not want Claire to have invasive measures at age 2

Here's Claire at age 4.5 after we masked the stain non-invasively:

Applied PAA conditioner to SDF stained lesions, "rinsed" PAA off with wet cotton, dabbed dry with dry cotton , applied Fuji EQUIA Forte and let dry

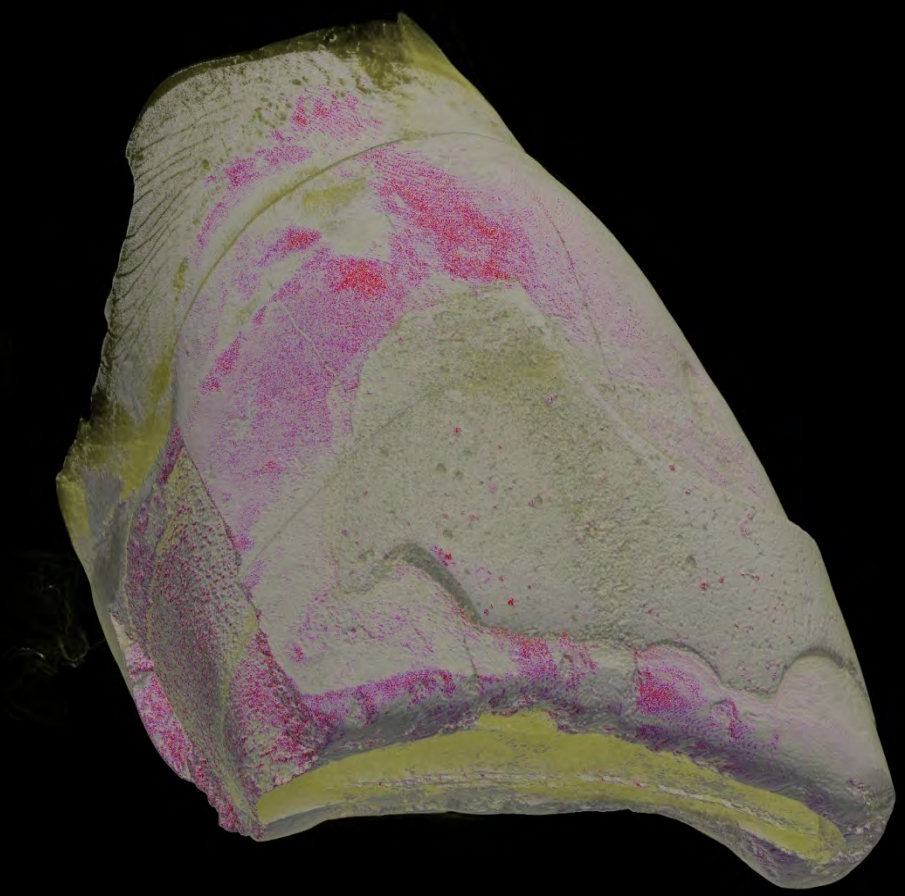
This was done on a couch in condo in Redmond, OR with zero aerosol, with Claire's mom, Drs Duffin and Horst watching and taking photos as I applied the GIC while I joked and played with Claire.

Then we all ate a spaghetti dinner together.

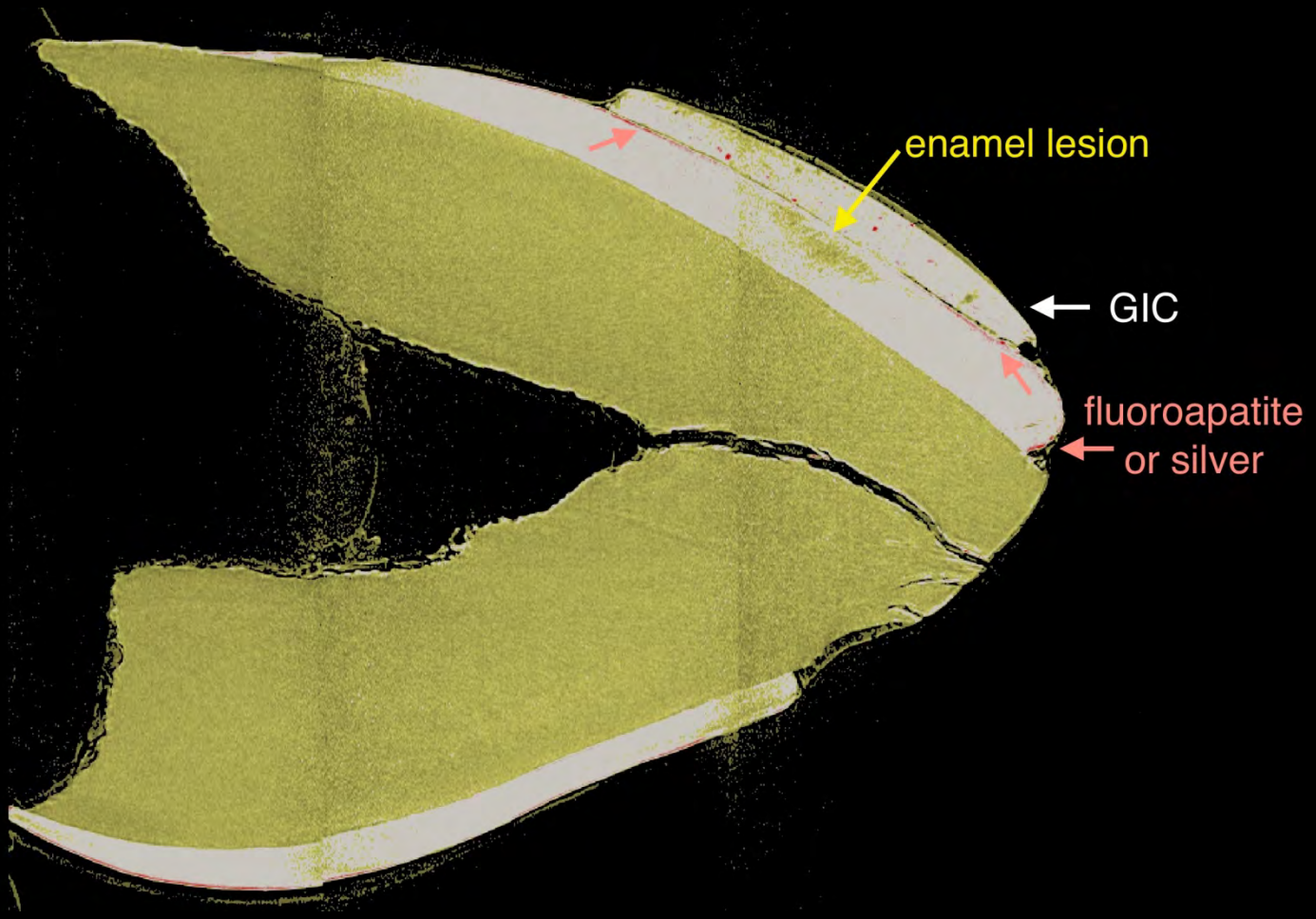
Two years later Claire's centrals exfoliated naturally:

This is an image of one of Claire's exfoliated centrals in the lab

The silver (here in pink) was first placed when Claire was 2yo. The GIC (here in white)was placed when she was 4.5 to cover the black SDF stain



Cross-section of Claire's naturally exfoliated tooth in the lab:



Let’s see this again on another patient:

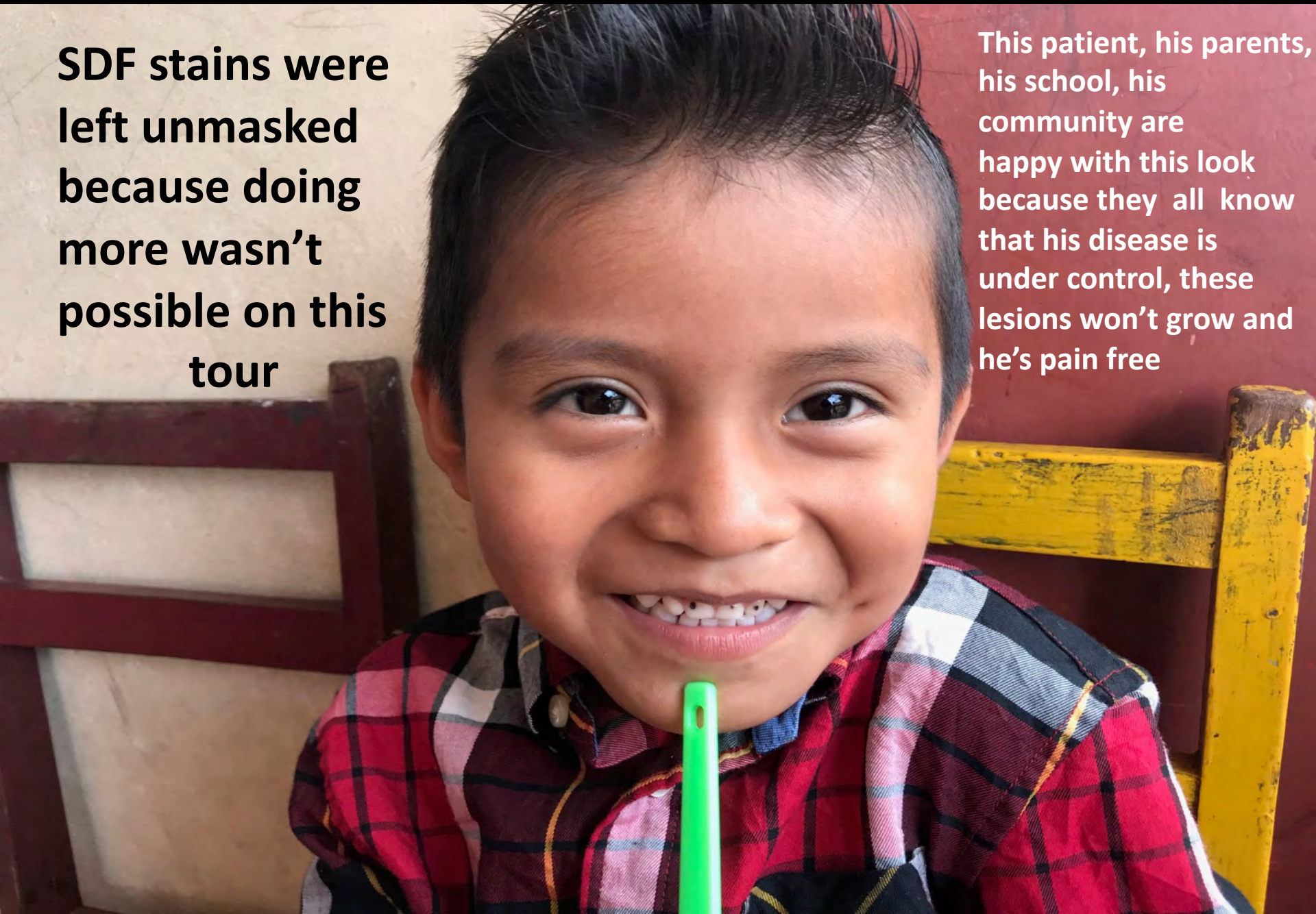
SDF 2X on a 4 yo caused black stains

GIC to mask the stain, no needles, no drills, no microbial aerosol

Let’s go back for a few minutes to discuss **using SDF alone:**

Is it terrible if we simply can’t mask black SDF stains on anterior primary teeth for whatever reason?

The new face of Bolivia



SDF stains were left unmasked because doing more wasn't possible on this tour

This patient, his parents, his school, his community are happy with this look because they all know that his disease is under control, these lesions won't grow and he's pain free

Bolivia

*"Today, we examined over 400 primary school children and found only **three children without any** signs of tooth decay."*

Dr. Steve Duffin, Sept 2017

"We cleaned and dried each caries lesion, applied SDF then immediately covered with fluoride varnish.

At the time of initial treatment, 50% complained of caries- related pain.

At 6-month recall, not one child complained of mouth pain ."

OMG, 400 teeth slathered with SDF!

What if an unnoticed pulp exposure was SDF'd

SDF over un-noticed pulp exposures:

- No problems reported in the literature over the past 50+ years when SDF was applied over unnoticed pulp exposures
- That's also the consensus of clinicians who've been applying SDF in the US over the past 10+ years.
- Do not apply SDF over a huge, obvious exposures.

SDF is so safe it can even be used for indirect pulp capping:

- Indirect pulp cap 0.25-.5 mm
- Did not induce any inflammation/necrosis
- Good tertiary dentin inducing ability
- Recommended as IPT materials for the management of deep cavities

Korwar et al. Contemp Clin Dent. 2015

SDF Messaging to parents

- Natural and Safe
- Used for 4000 years
- Easy to apply
- Does not sting or taste bad
- No shots or drilling
- Color change shows it's working (like a scar)
- Does not stain teeth, only stains decay!

SDF proven more effective against caries than restorations!

"SDF applied biannually is effective for arresting advanced cavitated carious lesions on any coronal surface

with moderate to high certainty."

(ADA Council on Scientific Affairs, Oct 2018)

It is exceedingly rare to have moderate to high certainty of evidence for any dental procedure.

SDF is actually beyond the evidence base for conventional restorations

Together, SDF + GIC for definitive and interim care are no longer on the fringes of dentistry

SDF and GIC are recognized as universally acceptable for ALL patients as a very high standard

How about using **GIC alone**?

A few days ago a dental colleague sent me an email saying this:

- While flossing, the back part of my upper right canine popped off - no pain or sensitivity.

- Unlikely I can get it treated by anyone for months.

- If things heat up I am wondering if I should try to put some SDF on it?

He took this screen shot with his phone

No dentist is going to see this guy…

But he’s a dentist himself!

Here's what I told him to do which is instructive to your learning about applying GIC

-Brush it as deeply into lesion as possible in the bathroom, then dry it as much as possible with cotton in front of the mirror, then scrub it for 20 seconds with PAA conditioner on a stiff microbrush to clean out any plaque you can't see, then rinse your mouth with fresh water, then bite on a cotton roll while you mix a cap of Fuji EQUIA Forte with your bike : Go to "Bicycle Triturator on YouTube

Apply the GIC with applicator gun to moist tooth surfaces, then press the material inside the tooth using your saliva to lube your finger so it doesn't lift out when you remove finger pressure.

Bite down to establish proper occlusion, then gently sculpt the distal with a Goldfogel Composite Spade or a Hollenback Carver lubed with your saliva, then floss the material incisal-to-cervical only once with the floss wrapped to the contour of the tooth, then draw the floss out sideways very carefully.

DO NOTMANIPULATE THE MATERIAL AFTER ITS INITIAL SET WHEN YOU CAN SEE THAT ITS LOSING GLOSS.

I would not apply SDF before applying the GIC because it can create an underlying dark stain if there's decay or hypomineralization , which might be seen through the translucency of this tooth which is in your smile line.

That is, by definition, non-restorative, minimally invasive dentistry

The ADA has designated SDF and other non-restorative or minimally invasive approaches as the only effective techniques to treat dental caries <u>without aerosolizing oral fluids…</u>

Because you can skip the compressed air!

Our Future:

With SDF + GIC, clinicians can dramatically reduce the burden of caries and keep patients out of pain during a crisis and during normal times

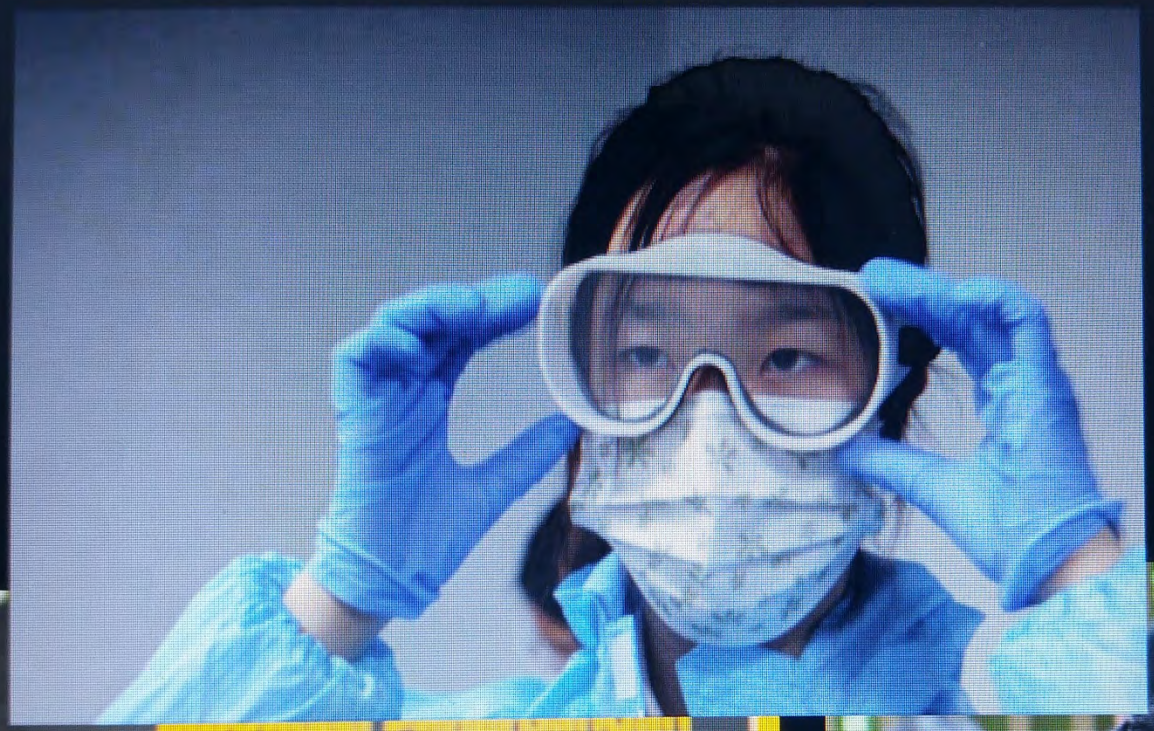
without creating dangerous microbial aerosols

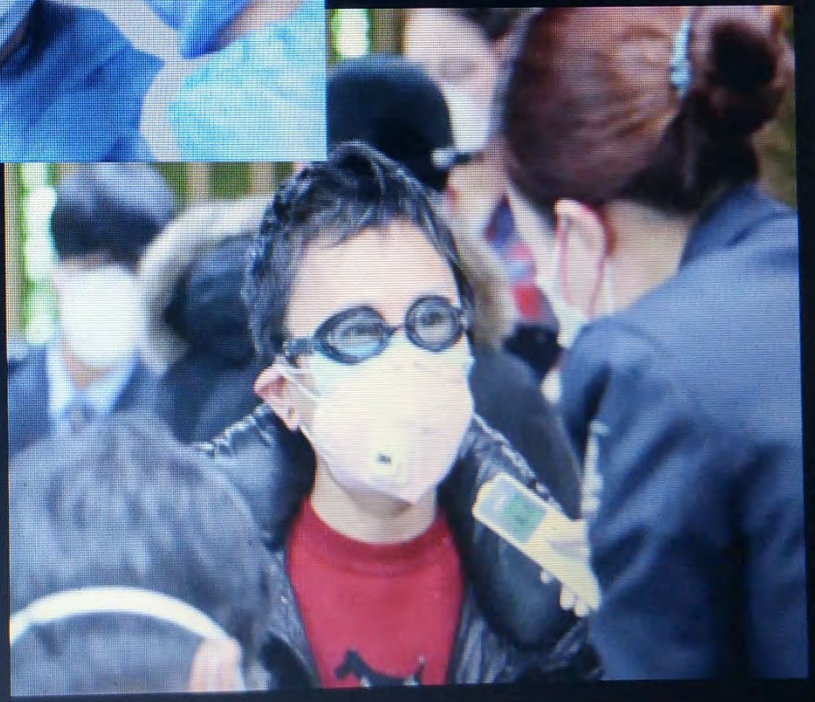
In the dental office,
Don’t disturb the plaque!

Comparisons of airborne particle in micrometers (uM)

- **Clear throat = 1**
- **Eat = 8**
- **Whistle = 12**
- **Cough = 36**
- **Sneeze = 530**
- **Brushing teeth = 2,500**

Aerosols ≠ droplets. Don't forget your **goggles!**





Is it really safe to apply SDF and GIC in the dental office today?

NO, not if you're going to be fined or arrested for being open when your state has closed down all dental offices, However…

SMART does not require dental units, aerosol, rotary drilling, air/water syringes …

SMART can be provided on kids knee-to-knee anywhere, indoors or outdoors, on a park bench or on the beach

SMART is safer for us and our patients and their families while still controlling caries and de-sensitizing symptomatic teeth

Food for thought about SDF application

-To avoid staining of hypomineralized enamel (which all newly erupted teeth have), instead of using SDF, just use GIC which has the same prevention effect, helps mineralize the enamel and doesn't stain.

-If patients want to drink water after SDF application, don't use compressed air and water syringe - have them use a straw to drink from a cup.

-Today and until mandatory precautions are lifted, we should avoid doing SMART in dental offices altogether because it's virtually impossible to protect a dental operatory from potential corona virus contamination including the air before seeing the next patient.

- Dentists and assistants can go to patient's homes if they dare if they use appropriate PPE but at all costs the should avoid aerosol to reduce microbes remaining in patient's living room, garage, basement, backyard, driveway etc.

-Right now, non-emergency treatments in the dental office are untenable with the need to prevent cross-contamination between patients, **however**

SMART can be delivered aerosol-free so it contaminates less

SMART, MID and MMC provide altogether new ways to address dental care for all patient populations over all socioeconomic strata because…

1) **Caries is a bacterial disease**

2) **Bacterial diseases of the human body cannot be treated effectively via surgical means alone**

3) **We can't chase down oral bacteria with drills and doing so spreads viruses**

But maybe you don't want to or aren't disallowed to see patients in person, even with proper PPE?

Here are ways to provide control over patient's dental disease safely over the phone or the Internet:

1) Contact high risk patients to send them to the pharmacy for 5000PPM Rx t-paste with instructions to use it instead of regular paste, no rinsing after brushing and floss after brushing before bedtime.

2) Refer Patients to newenamel.com for free risk assessment so they can order a kit of FV and/or Rx t-paste delivered to their house, but newenamel is not allowed to send SDF

3) Conduct patient motivational phone interviews to help patients with better home care and/or to change their caries-causing dietary habits like recommend ing "replacement therapy"

(i.e. replace sour gummies or crackers+chips with chocolate and nuts for snacking)

Take-home message:

To change utilization rates, get more people to the dentist , to get dentists to more people before they experience infection and tooth pain, and to be healers in a pandemic and its aftermath…

…we need to modify conventional thinking about dental treatments which are painful, frightening and too often ineffective against the disease.

LET'S ASK OURSELVE THIS:
WHERE DO DECAY-CAUSING MICROBES GO WHEN WE DRILL ??

-On the walls

-In our hair

-In our eyes

-Into dentin tubules after excavation

Microbes look like this inside dentinal tubules when we try to drill decay “away”

Precision Dentistry

Is surgical dentistry working on this level? SDF to address this level, the cause.

Fig 112, Invasion of bacteria in dentinal tubules via apertures denuded of cementum during aggressive scaling and root planing (Fig 111) bar = 10 µm; (Fig 112) bar = 1 µm. (From Adriaens et al 1988b. Reprinted with permission.)

It isn’t possible to pass dental boards without demonstrating total caries removal-despite new evidence that shows poorer outcomes when we do.

Regardless, don’t drill initial lesions

Initial lesions

are reversible with antimicrobial and re-mineralizing agents thus :

For initial lesions, excavation of decay is contraindicated

End of 1st lecture

ALL Non-cavitated lesions can re-mineralize

So which lesions should we treat non-restoratively

JADA, Feb 2015 identifies the ADA's recommended way to classify lesions in terms of what should and what should not be drilled :

COVER STORY

The American Dental Association Caries Classification System for Clinical Practice

A report of the American Dental Association Council on Scientific Affairs

Douglas A. Young, DDS, EdD, MBA, MS; Brian B. Nový, DDS; Gregory G. Zeller, DDS, MS; Robert Hale, DDS; Thomas C. Hart, DDS, PhD; Edmond L. Truelove, DDS, MSD; American Dental Association Council on Scientific Affairs

ABSTRACT

Background. The caries lesion, the most commonly observed sign of dental caries disease, is the cumulative result of an imbalance in the dynamic demineralization and remineralization process that causes a net mineral loss over time. A classification system to categorize the location, site of origin, extent, and when possible, activity level of caries lesions consistently over time is necessary to determine which clinical treatments and therapeutic interventions are appropriate to control and treat these lesions.

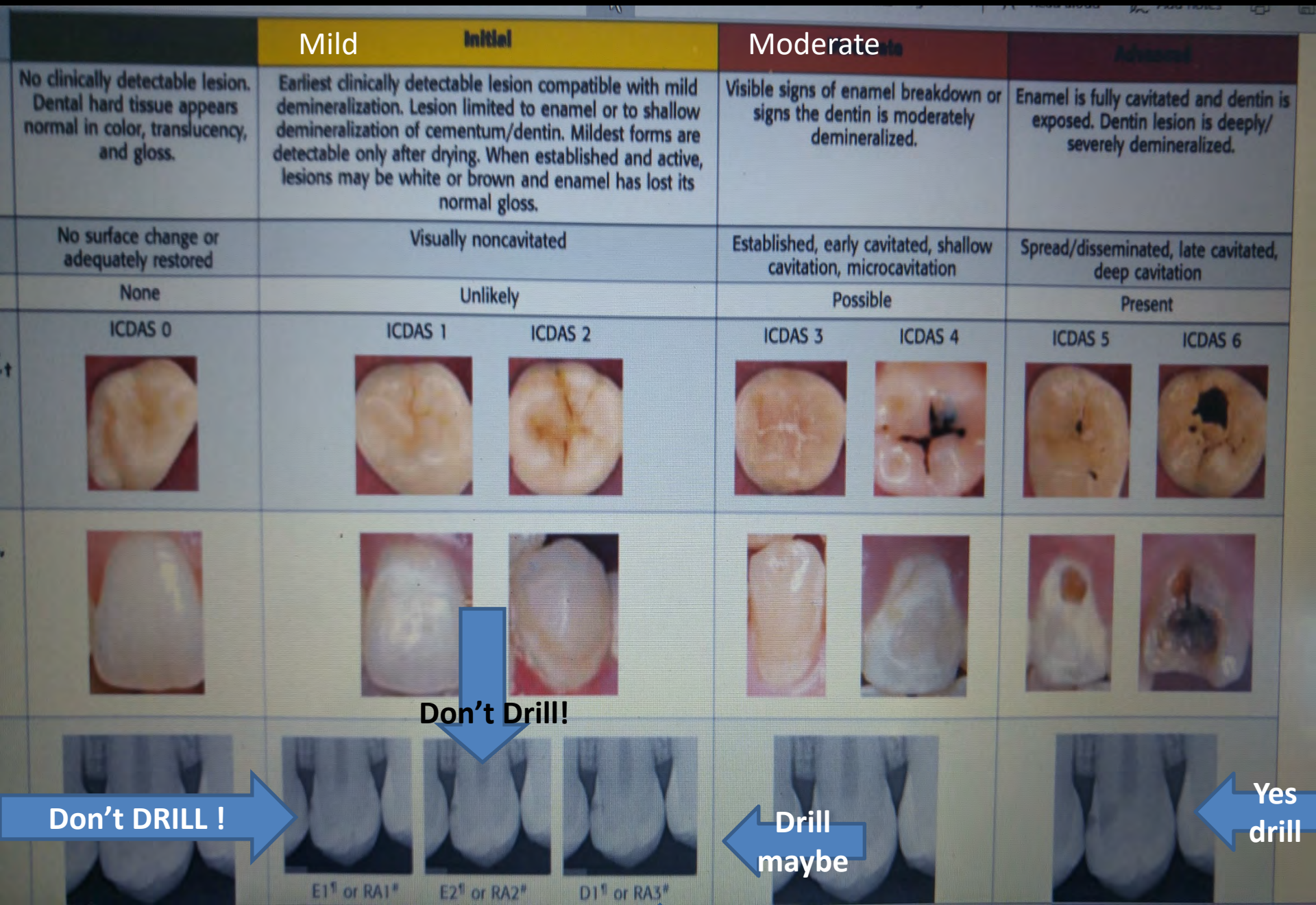
Methods. In 2008, the American Dental Association (ADA) convened a group of experts to develop an easy-to-implement caries classification system. The ADA Council

Dental caries remains a common chronic disease and, in the absence of treatment, it may progress until the tooth is destroyed. Despite advances in restorative materials and the implementation of various preventive approaches, more than 90% of adults in the United States have experienced dental caries before 30 years of age.[1,2]

Dental caries is a multifactorial disease involving

D1 lesions is where the line is drawn on whether or not to drill

	Mild (Initial)	Moderate	(Advanced)
No clinically detectable lesion. Dental hard tissue appears normal in color, translucency, and gloss.	Earliest clinically detectable lesion compatible with mild demineralization. Lesion limited to enamel or to shallow demineralization of cementum/dentin. Mildest forms are detectable only after drying. When established and active, lesions may be white or brown and enamel has lost its normal gloss.	Visible signs of enamel breakdown or signs the dentin is moderately demineralized.	Enamel is fully cavitated and dentin is exposed. Dentin lesion is deeply/ severely demineralized.
No surface change or adequately restored	Visually noncavitated	Established, early cavitated, shallow cavitation, microcavitation	Spread/disseminated, late cavitated, deep cavitation
None	Unlikely	Possible	Present
ICDAS 0	ICDAS 1 ICDAS 2	ICDAS 3 ICDAS 4	ICDAS 5 ICDAS 6

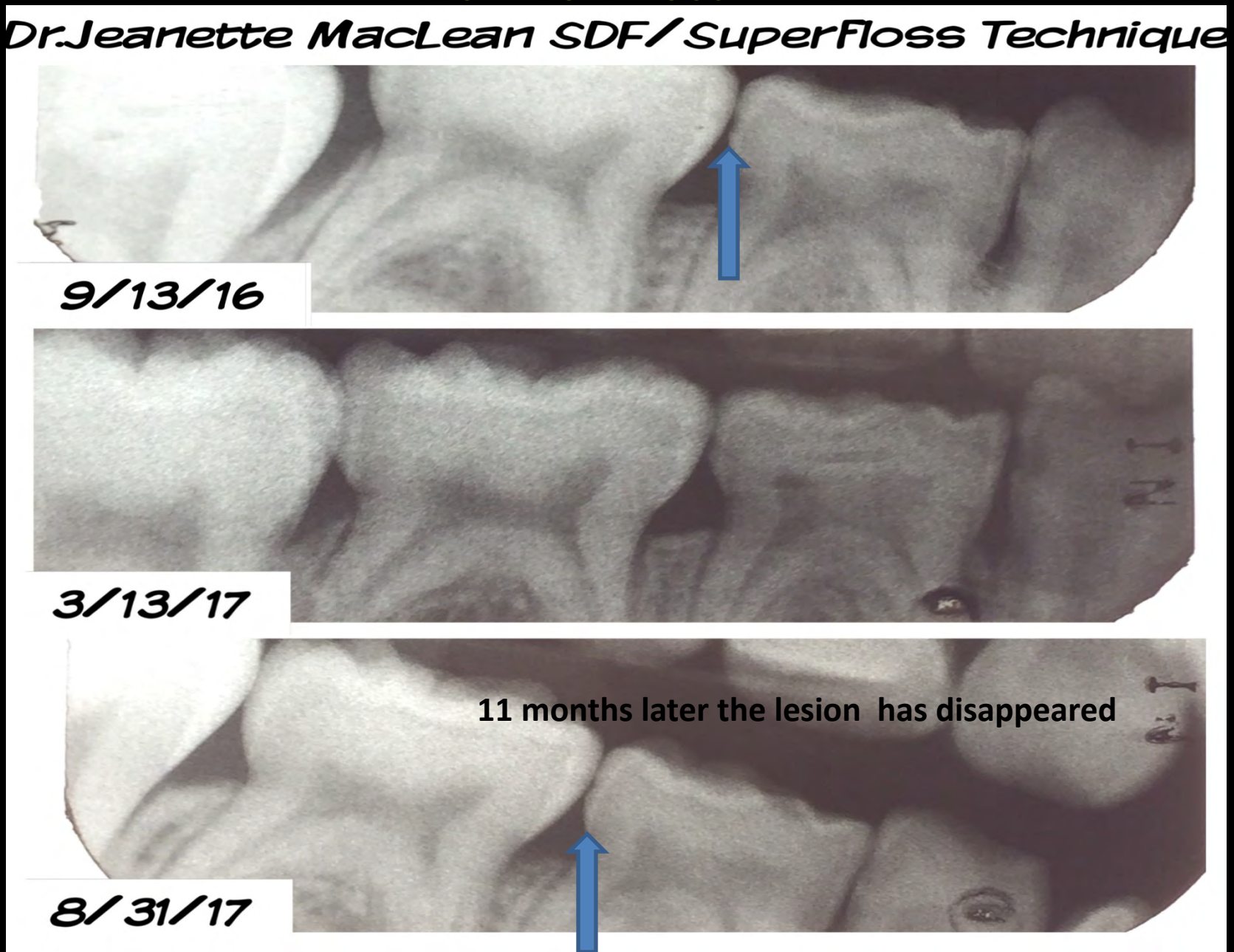


D2 lesions can go either way but the ADA says DO NOT drill E1 and E2 lesions!

BECAUSE ALL NON-CAVITATED LESIONS CAN BE RE-MINERALIZED

with Saliva, SDF, 5000ppm fluoride, CAMBRA, diet modification , and Glass-ionomers!!

Initial interproximal E1 and E2 lesions re-mineralized with SDF on floss



PROTOCOL FOR FLOSSING SDF into E1+E2 interproximal lesions

- 1-2 drops of SDF in a dappen
- Protective glasses on patient, isolate and cotton dry one quadrant at a time.

-Dry and Apply plenty SDF from a microbrush onto the marginal ridges and between the teeth so the SDF can penetrate interproximally as much as possible through capillary action.

- Use regular waxed floss ,unwaxed floss or Superfloss to draw the overlying SDF **from** the marginal ridges **to** between the teeth
- Remove floss sideways, don't snap!
- Apply FV or a thin layer of petroleum jelly over the SDF and the tooth to mask taste and to prevent immediate salivary dilution.
- Proceed one quad at a time with SDF/ floss/ FV to assure that full-concentration SDF does not get immediately diluted by saliva which often happens if we try to floss SDF between teeth in all 4 quads at once.

My ever changing personal decision tree

D1+ D2 drill?

E1 No Drill

Today I would not drill #T due to aerosol- I'd try repeat SDF + watch . If it grows, I'd bust thru marginal ridge with hand drills then Class II SMART

E2: no drill, cavitation is not into dentin: Floss in SDF

E1: No drill , SDF on mcrobrush + and floss only

Hand Drills

Exacto Knife Handles for hand Drills: $12.95 Amazon

https://www.amazon.com/Mudder-Precision-Stainless-Scrapbooking-Stencil/dp/B07XG1P96X/ref=pd_ybh_a_41?_e

Mudder 15 Packs Hobby Knife Precision Knife Set, Stainless Steel Precision Cutter Refill Craft Knife for Phone Repair, Art, Hobby, Scrapbooking, Stencil (Silver)

by Mudder

Roll over image to zoom in

4.5 out of 5 stars 19 ratings

Was: $13.99

Price: $12.99 prime & FREE Returns

You Save: $1.00 (7%)

Color: **Silver**

- What you get: 15 packs hobby knife with safety cap, enough for your daily use; Useful knife set for lightweight precision cutting; Each knife is 14 cm/ 5.5 inch in length (length of the safety cap is not included)
- Wide applications: precision knife with No.11 fine point blade, pointed enough for precise cutting, engraving, trimming and stripping from delicate to thick material, including paper, fabric, mat board, plastic, leather, metal, etc.
- Good quality: the stainless steel blades are very pointed and the lightweight metal handle make cutting more easy, save your time and energy; Safety cap can protect you from getting hurt when the knife is not applied
- How to use: first, unscrews the tip of your knife to unlock the blade and take out the dull razor, then swap out to lock the replacement blade in place and tighten it back up
- Attention please: these blades are very pointed, so please watch out your fingers when you replace the blade to avoid any cutting and scratches; Cover the precision knife blade with safety cap after every-time use and keep it away from children

Compare with similar items

Round burs #2,4,6,8 installed in Exacto knife handles

Hand drills create zero aerosol

Twist them one quarter turn between forefinger + thumb

Hand drills remove only what should be removed while leaving what should be left in the tooth.

-Minimal invasiveness

-Zero aerosol

-No removal of leathery dentin

Hand drill Protocol

- **They can't remove what *can* be re-mineralized**

- They don't require the need for LA

- They can break thru thin marginal ridges into underlying decay

- They can remove Class II composites and amalgams with underlying recurrent decay

-They don't create aerosol

-After hand drilling, apply PAA conditioner vigorously with a stiff microbrush to remove as much remaining plaque, debris + pellicle as possible, then "rinse" with damp cotton, then dry with dry cotton.

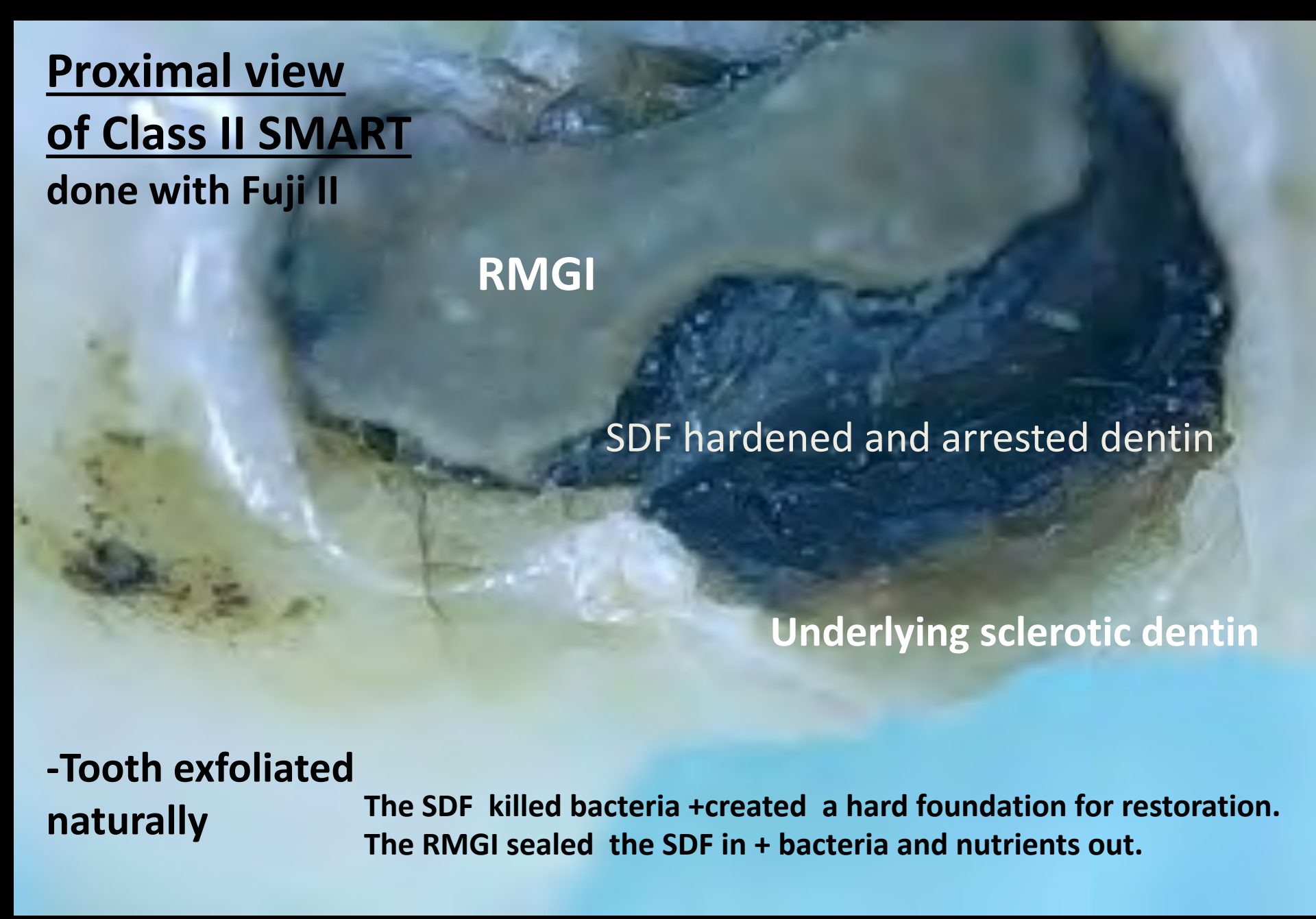
-Then apply SDF vigorously with stiff microbrush, leave all surfaces SDF-moist".

-Apply GIC or RMGI as per previous protocols.

Class II SMART Protocol

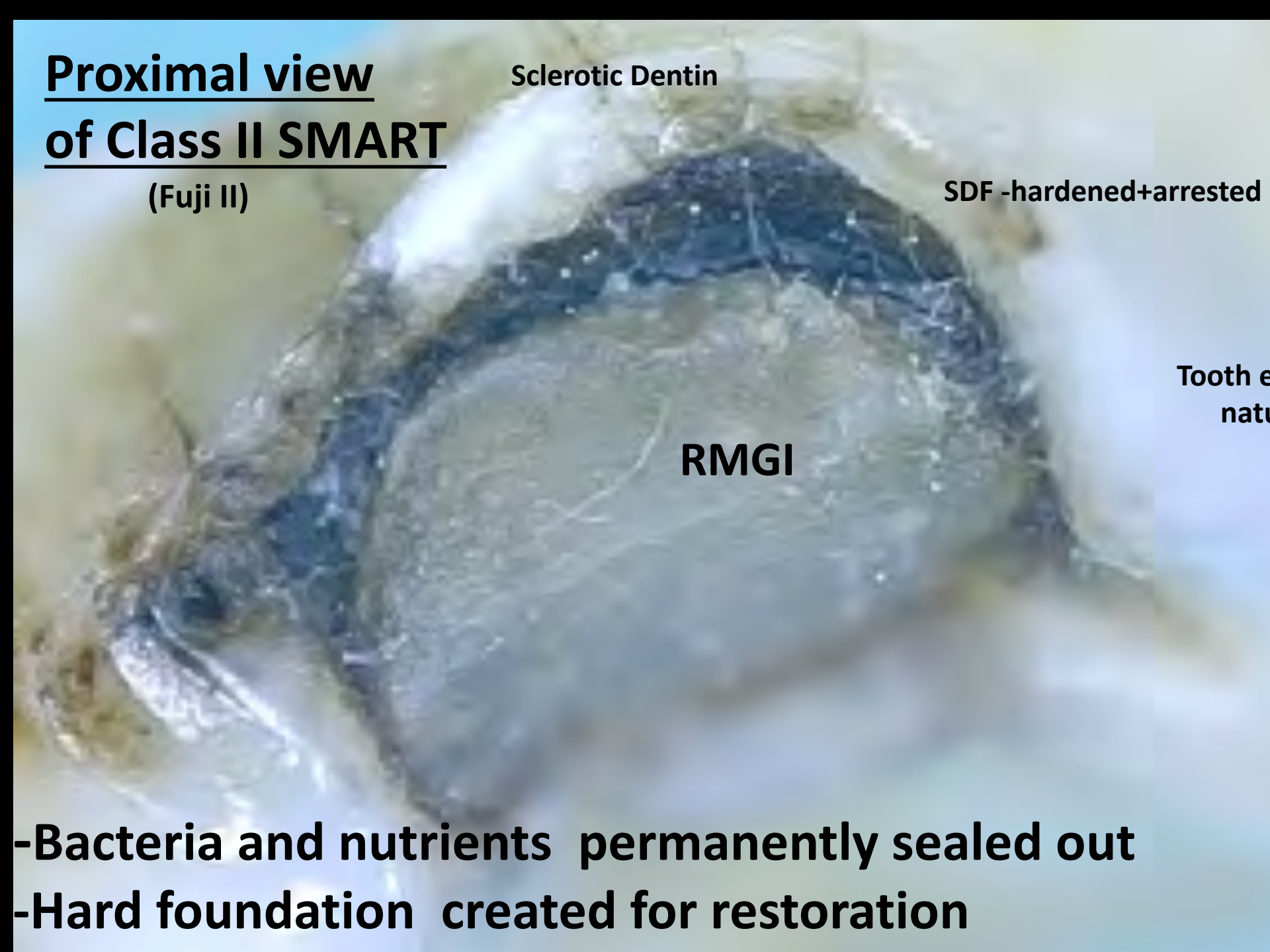
If RMGI: Same as for one surface SMART then after contouring restoration and checking occlusion light cure for 1sec, floss contact while closely following contour of crown, then slide floss out to side, then complete light curing process.

If GIC: Same as above, then floss as above just at the moment the material begins to set, then draw floss out to side, done.



-Tooth exfoliated naturally

The SDF killed bacteria +created a hard foundation for restoration.
The RMGI sealed the SDF in + bacteria and nutrients out.

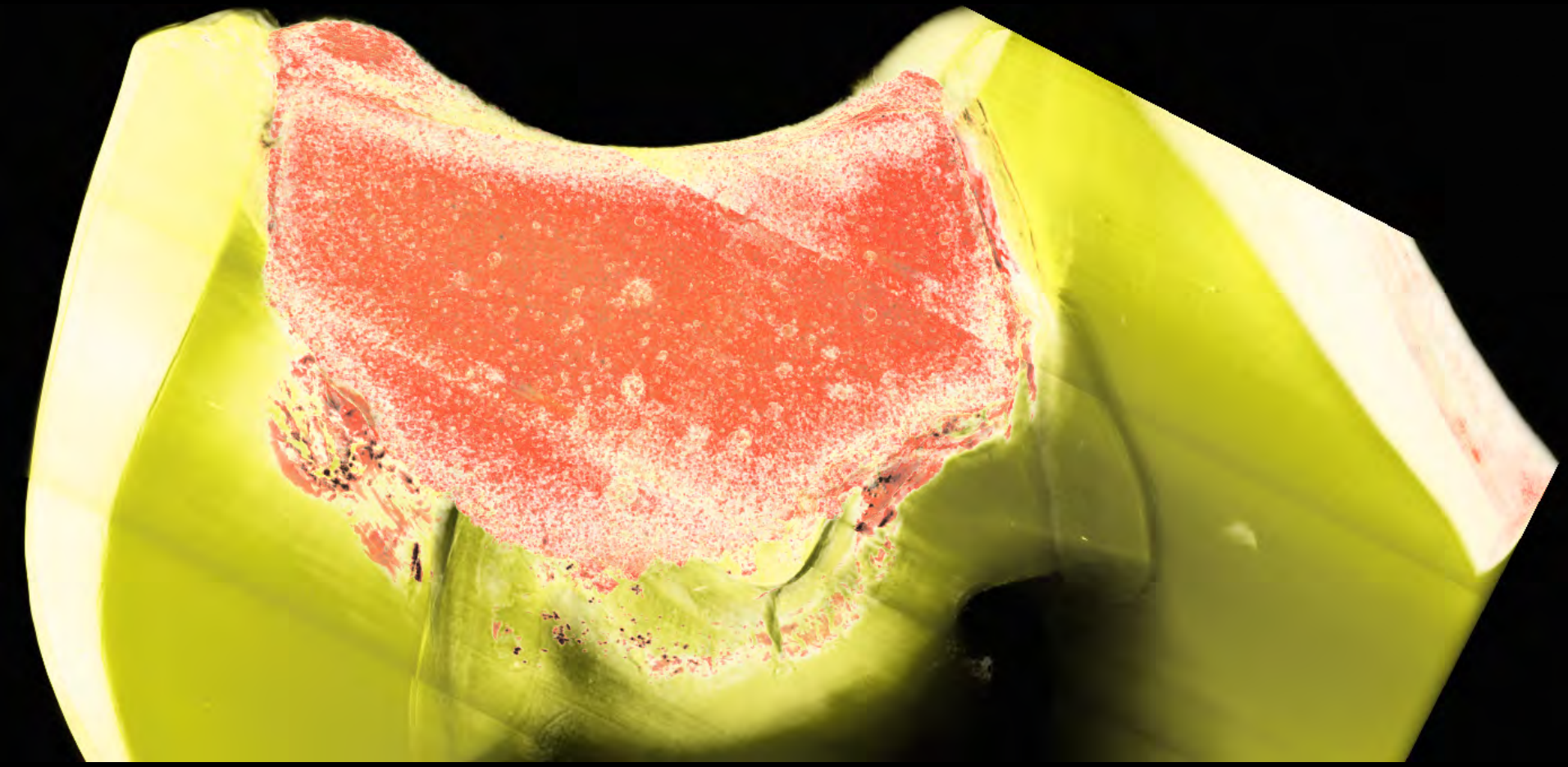

Proximal view
of Class II SMART
(Fuji II)
Sclerotic Dentin
SDF -hardened+arrested
Tooth e
natu
RMGI
-Bacteria and nutrients permanently sealed out
-Hard foundation created for restoration

From Decayed tooth to Super tooth

From these previously decayed teeth in an unmanageable kid we created “super teeth” with no aerosol, no needles and the work was done knee-to-knee with his mom. It could have been done outside on a park bench.

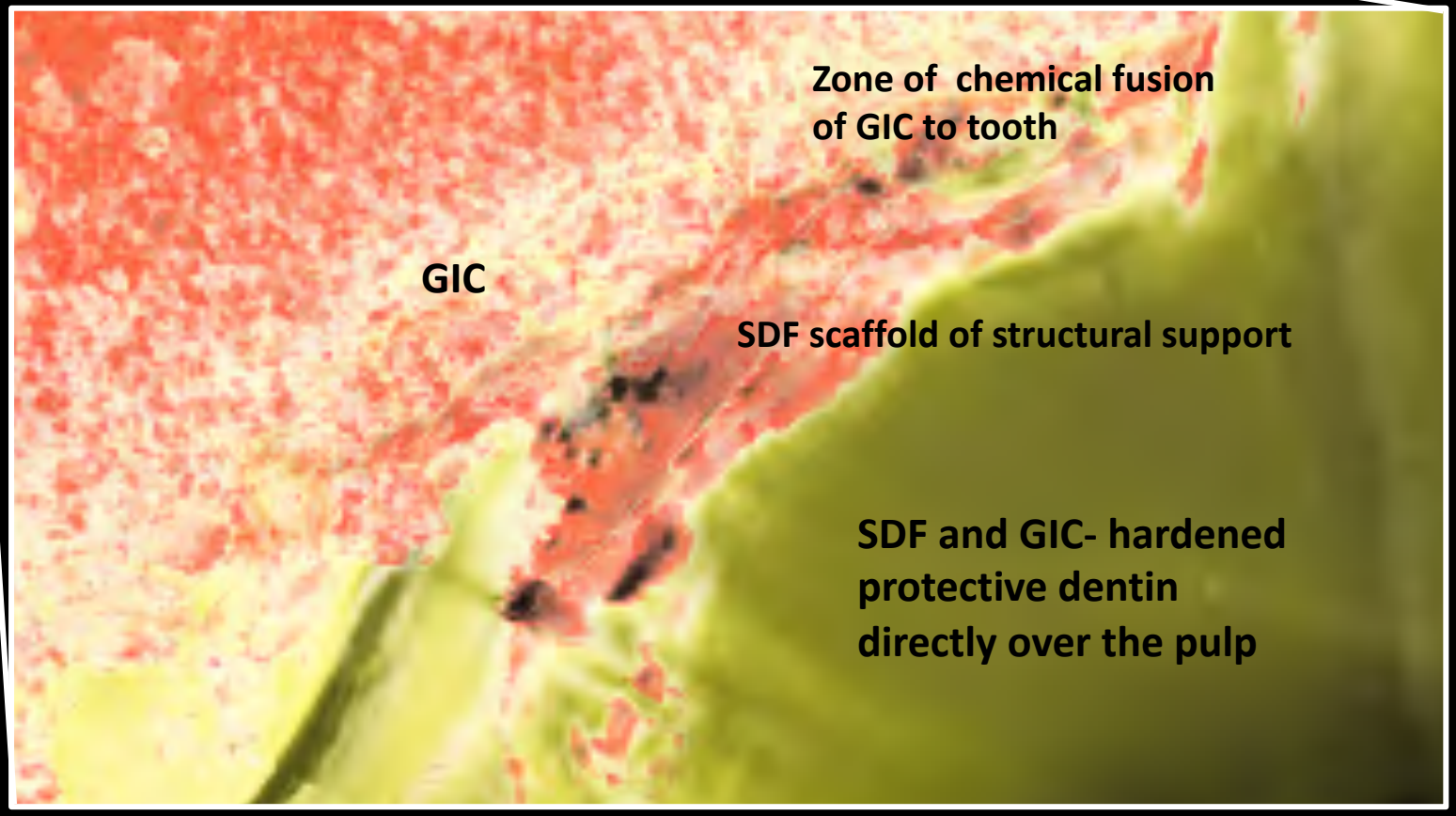
His teeth exfoliated naturally.

SEM Image of SMART (Fuji II)



Underlying SDF hardened the lesion so the GIC stayed put.
The RMGI matured +permanently fused to the rest of the tooth.

Super-hardened dentin was created by the underlying SDF seen here as “waves” over dark silver ion deposits



Goals 1) Seal bacteria and nutrients out (GIC)
2) Create hard foundation for restoration (SDF)

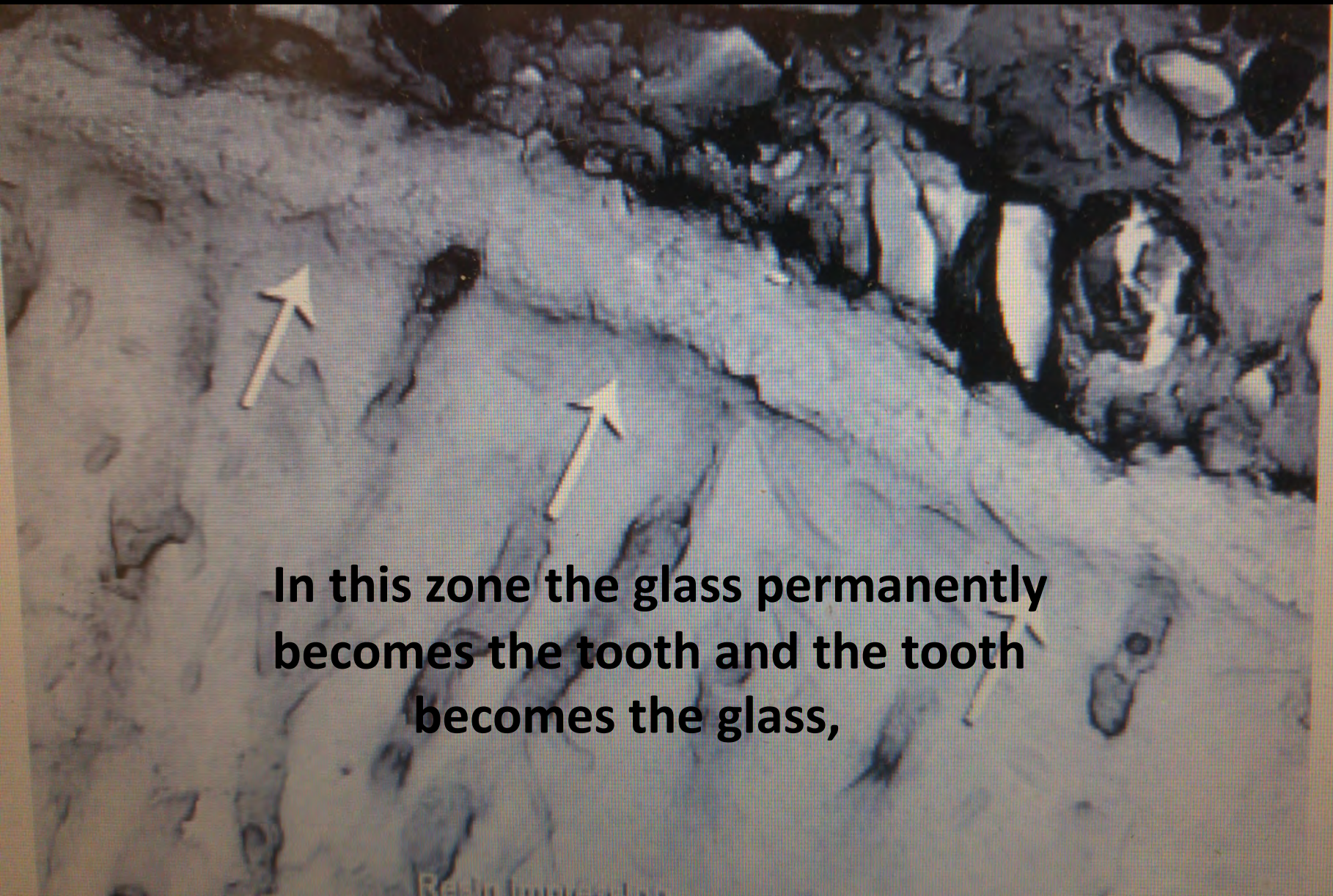
Permanent **Acid Resistant** **Zone of Chemical Fusion** between RMGI and dentin

Cardoso MV, Delmé KI, Mine A, et al. Towards a better understanding of the adhesion mechanism of resin-modified glass-ionomers by bonding to differently prepared dentin. J Dent. 2010;38(11):921–929.)

Remove plaque and pellicle first!

Please remember: must first remove plaque and pellicle and use PAA tooth conditioner to get the permanent zone of acid resistant chemical fusion to form

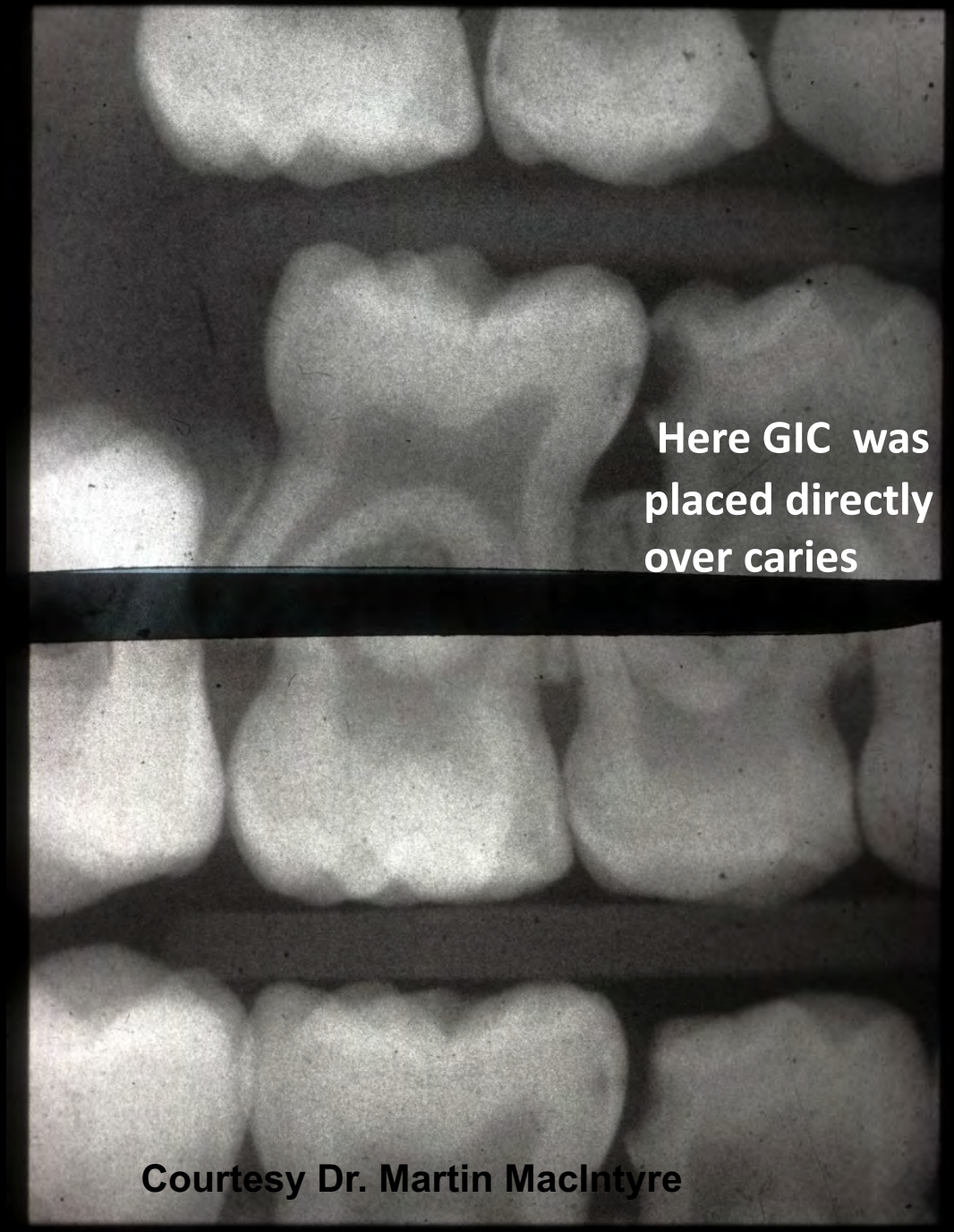
The permanent Acid Resistant Zone of Chemical Fusion



In this zone the glass permanently becomes the tooth and the tooth becomes the glass,

Age 5

Age 7



A Class II GIC (no SDF) fell out but the permanent zone had already formed which kept the tooth decay-free

Just because you use GIC does not mean it's "Interim"

How to treat a whole mouhtful of multiple deep lesions in one fast de-sensitizing, minimally invasive appointment

A case study:

4yo in foster care.

Very high risk of caries.

Molar and anterior teeth severely affected.

She had SDF 1X for control was headed for hospital dentistry when I met her.

She was living with her 4th foster mom and was on her way to living with a 5th

She got these SMARTs at her recall exam with me.

I finished them in an hour and she loved every minute of it

She called these her “Black Diamonds” and I cancelled her hospital OR visit

Outcomes

-Strong foundation for an overlying restoration because SDF treated dentin is 2X stronger than normal dentin

-Bacteria and nutrients sealed out permanently by the RMGI (Fuji II)

-**Coded and charged for multiple composite surfaces** done in one appointment (SMART is a "composition of materials").

-**More immediate income in one appointment than multiple appointments of one-quad-at-a-time dentistry** that she couldn't handle at age 4

- **More patient safety + more office income than referring to the OR**

-**Bioactive SDF+ GIC controls the disease and prevents** caries on all teeth adjacent to those treated.

Codes and billing

- SDF only for caries arrest– code 1354
- Disking/enamelplasty – code 9971
- Topical fluoride to prevent caries – code 1208
- Same Day SMART – code for “composite per surface” but not for 1354
- Multiple Day SMART – code 1354 each day you apply SDF then bill only for “composite per surface” on the day of SMART

New Data from Dr. Rick Niederman NYU, 2019

- SDF: ~80% effective, 5 minutes, ~$5 USD for supplies
- ITR/ART: ~80% effective, ~15 minutes, ~$12 USD for supplies, equipment , electricity
- SDF + ATR= SMART: ~96%, ~20 minutes, ~$15 USD for supplies
-

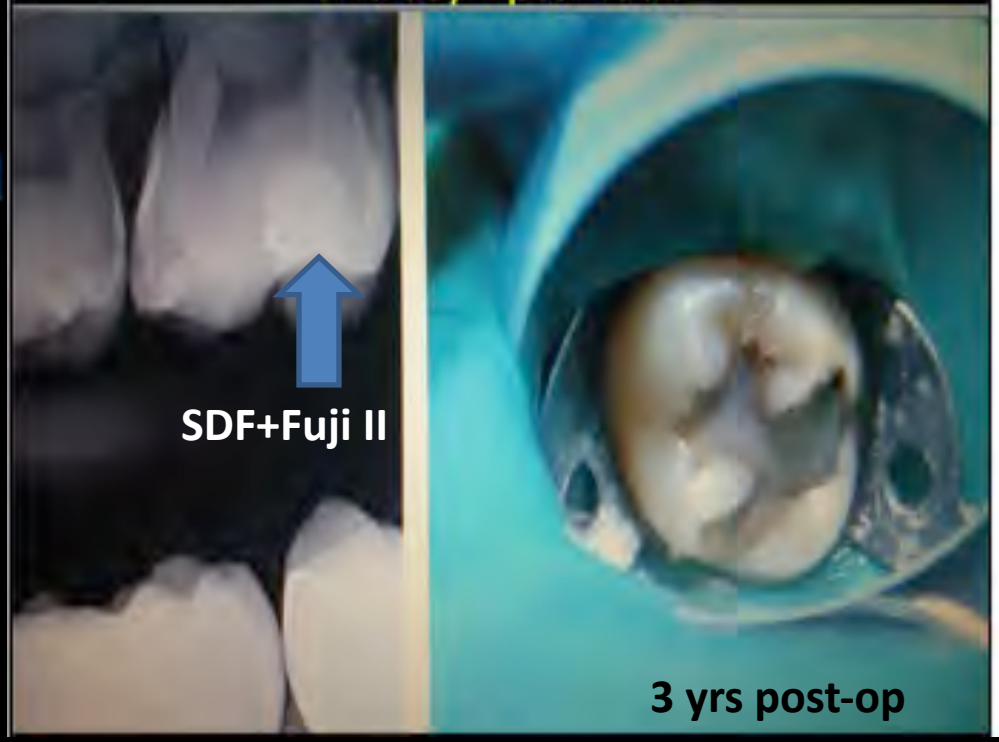
How about SMART on a Permanent Molar?

Case Study:

Large caries lesion in #14 in a 6 yo

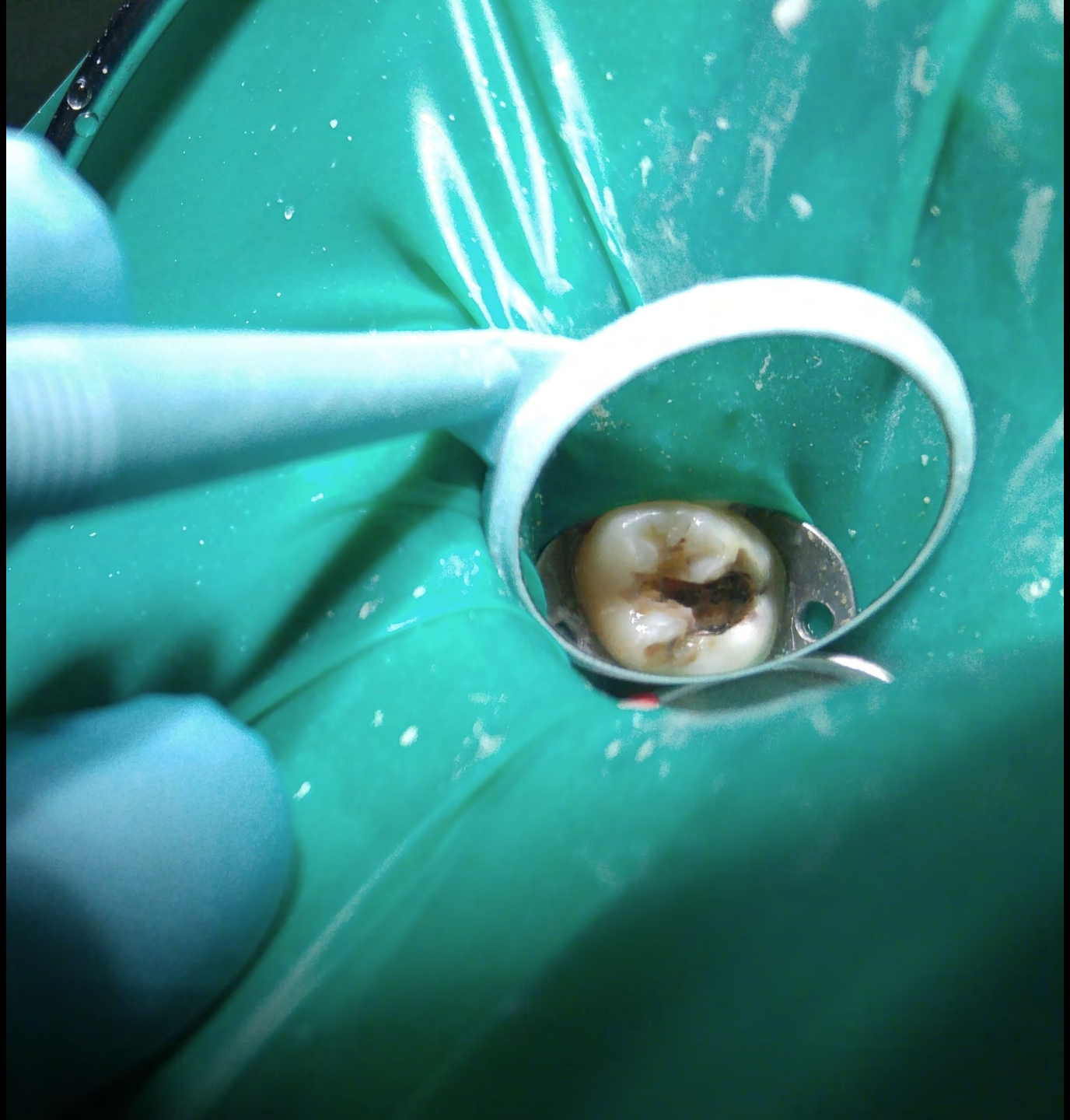
Same tooth (#14) , 3 + yrs post op

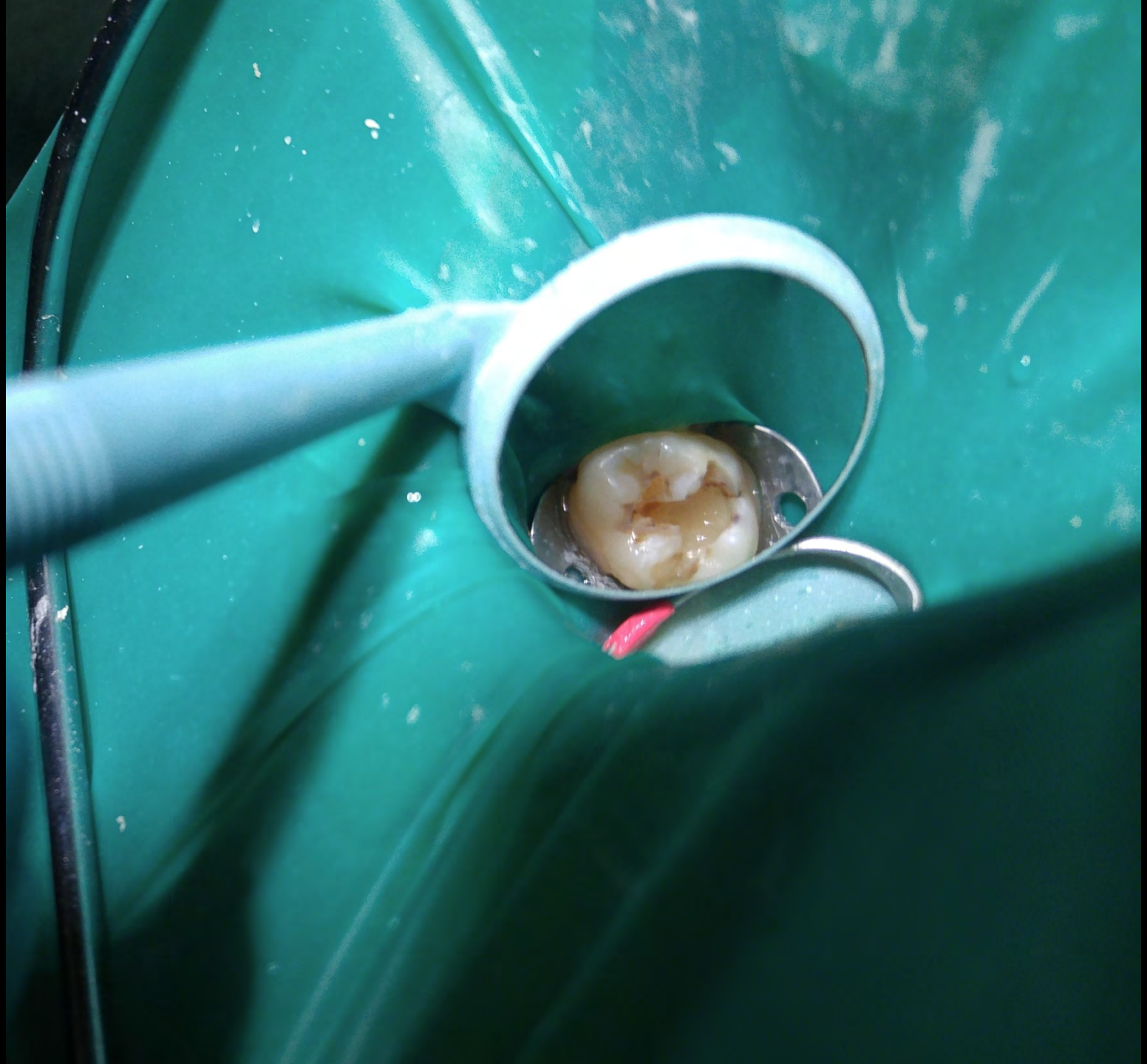
No radiographic evidence of decay growth and asymptomatic



Sealed bacteria and nutrients out (GIC)

Created hard foundation for restoration (SDF)





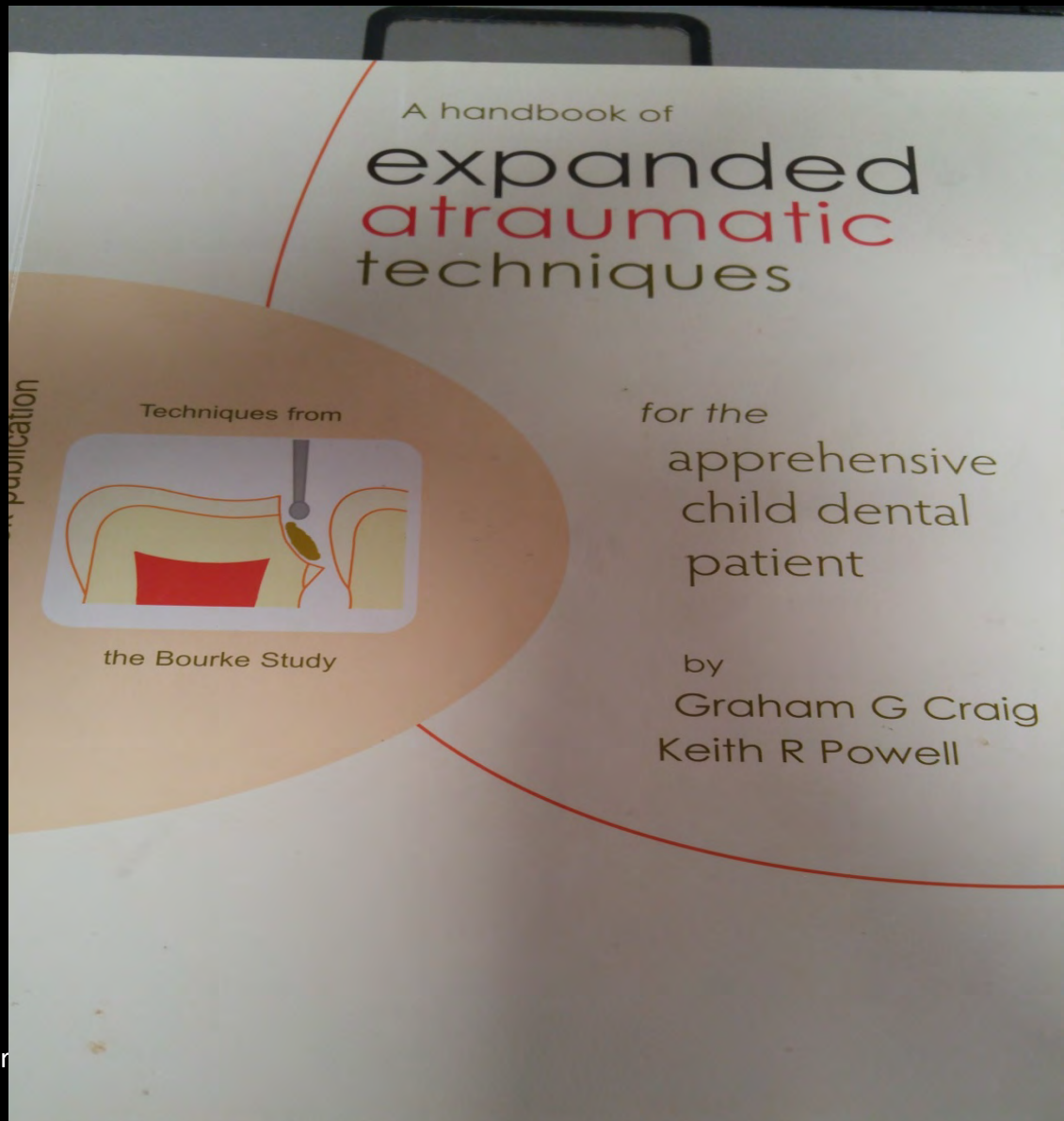
Evidence for SMART :
Three clinically proven procedures:

1) SDF to arrest and re-mineralize
2) Partial or incomplete caries removal **a newly recognized higher standard**
3) GIC to re-mineralize and deter microbes

All three have high levels of evidence
and none violate the individual principles
of the other two

More **EVIDENCE for SMART**:
The Bourke Study, 1978, Dr. Graham Craig

SMART was successfully delivered and documented showing partial caries excavation +silver ions + GIC over 30 years ago on phobic children in a remote Aborigine village in Australia.



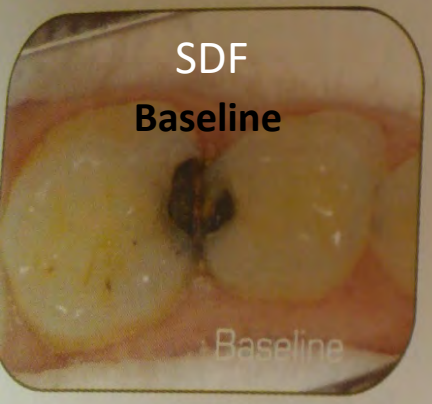
Dr. Graham Craig's Evidence:

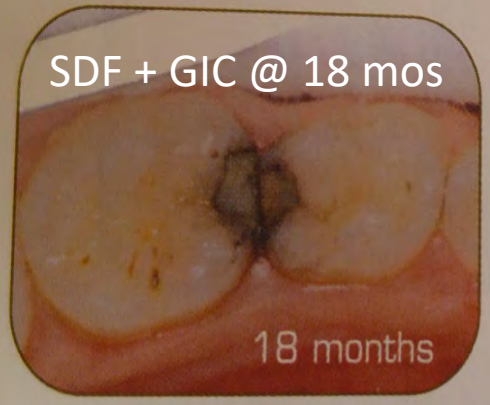
Early SMARTS at baseline, 18, 24 and 48 months (done in 1978)

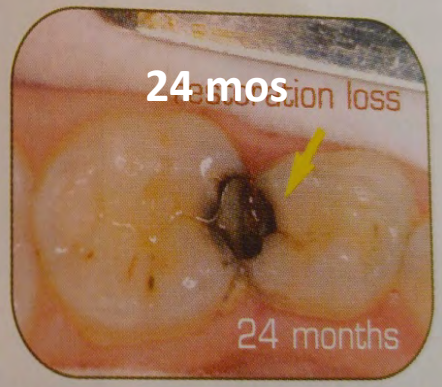
>> Interim restorations on the distal surface of lower first primary molars: (cont)

2

Shown below is an example of how it was harder, when only hand excavation was used for cavity preparation, to retain an interim restoration on the distal surface of a lower first primary molar than on the mesial surface of a lower second primary molar.







Open lesions prior to cavity preparation and the

After 18 months both restorations were still in

By 24 months the restoration in the distal surface of

By 48 months the original restoration in the second primary molar was still in

Dr. Craig treated indigenous kids who were previously treated by other dentists .

They were frightened of needles and drills even though their previous dentists were well intentioned.

The conventional D+F dentistry provided by previous dentists wasn't holding up due to recurrent decay from materials and protocols with no bioactivity, no anti-microbials, no re-mineralizers.

That was the initial motivator that convinced some of us to try combining SDF with GIC :

We immediately observed improved patient behaviors and an increased willingness to return for follow-up care when we began providing SMART.

This is the universal reaction of kids and parents to **SMART** because it doesn't hurt

How about anterior teeth that we don’t want to stain?


Before
Centrals and laterals had partially arrested caries from previous SDF 1X
After
Stain removed with hand instruments no LA, no additional SDF then RMGI
Outcome: teeth remain symptom until normal exfolation and we g acceptable aesthetics with no dangerous microbial aerosol

Protocol to mask anterior SDF stains with opaque GI on facial surface only

-If patient allows, remove any previous SDF black scaring with hand instruments. No LA needed because previous SDF de-sensitizes.

-10-15 sec of PAA conditioner is a must, dab with wet cotton, dab with dry cotton, leave all surfaces moist.

-Apply GIC or RMGI with w/hand instruments and/or fingers lubed with patient's saliva or thin layer of Vaseline.

-Don't manipulate material after it's initial set at loss of gloss .

-RMGI can self-set even before you light cure and it sets up faster under lights - prevent that!

- If GIC - wait till set. If RMGI - light cure.

Strip Crowns provide the same thing but with full crown coverage

Strip Crowns

Strip Crowns come in sets for primary and permanent anterior teeth

Cut, trim, test fit, and use explorer to poke 2 vent holes thru the lingual surface of the form to prevent bubbles/voids when filling with GIC/RMGI

Strip Crown Protocol

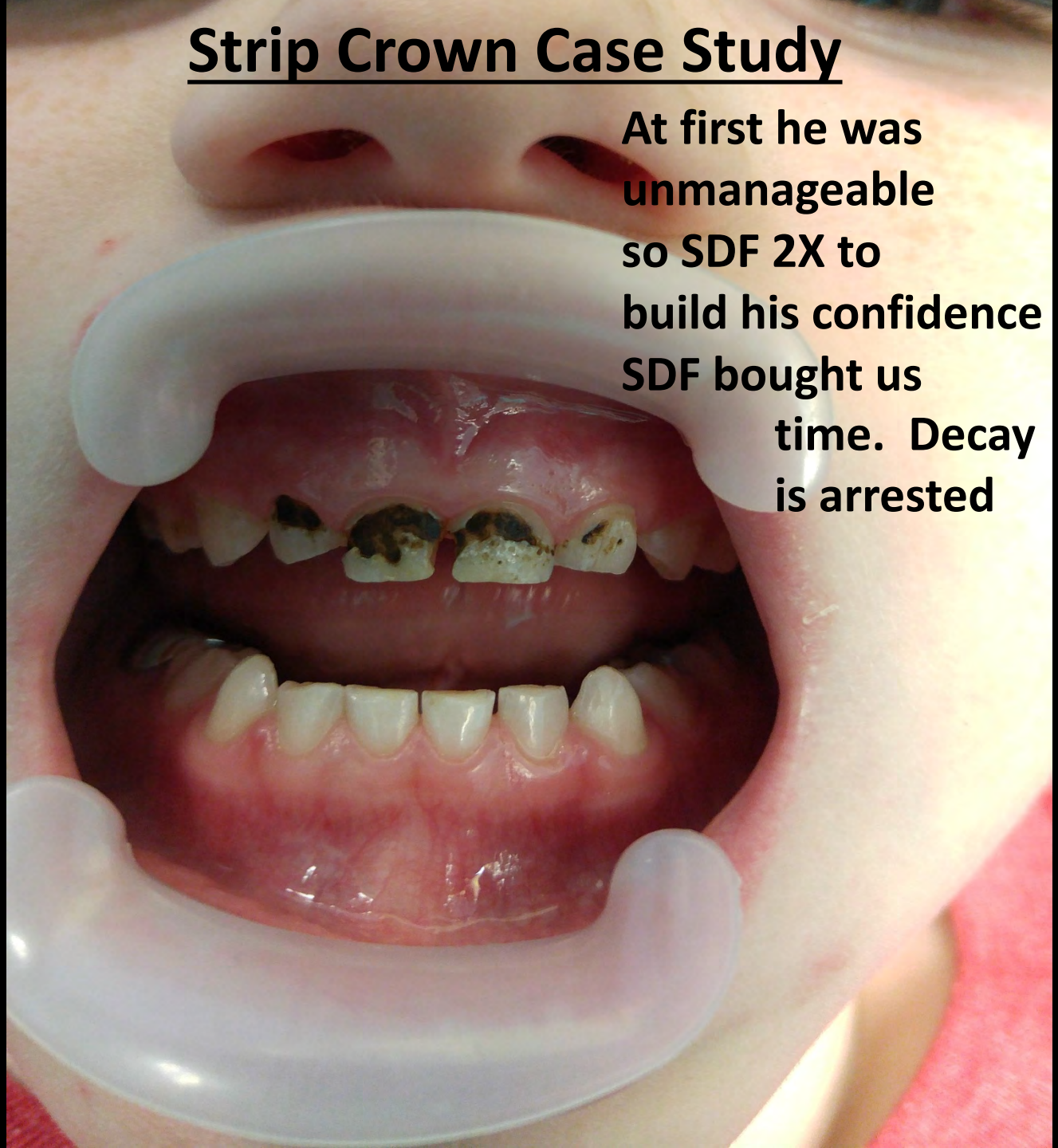
-Remove as much plaque, soft un-remineralize-able material and as possible by using non -aerosol methods with cotton products, spoon excavators and hand drills.

-Apply PAA conditioner to all tooth surfaces using a scrubbing motion then “rinse” with wet cotton leaving all surfaces moist

-Fill crown form with GIC or RMGI, carefully seat over tooth with gentle but firm finger pressure, remove excess material that squeezes thru the vent holes, wait 4 min if GIC, light cure if RMGI.

-Remove/ “strip” crown if patient behavior allows. If not, strip it off at a future appointment

Strip Crown Case Study



At first he was unmanageable so SDF 2X to build his confidence SDF bought us time. Decay is arrested


SDF was a-traumatic which helped him to be manageable enough for us to do Strip Crowns
Crown forms still on teeth in this pic
Note SMARTS were also done on #K+L during the Strip Crown apt!

Proud of his own behavior, loves his new white front teeth, no needles, no drills, mom thinks we're heroes

Hall Crowns

- Sealing technique
- Stainless steel crowns
- No local anesthesia, no needles, no drills
- **No aerosol**
- Creates a high bite that resolves spontaneously in days or weeks
- Child friendly

Meta Analysis of Hall Crowns,

JADA, 2015

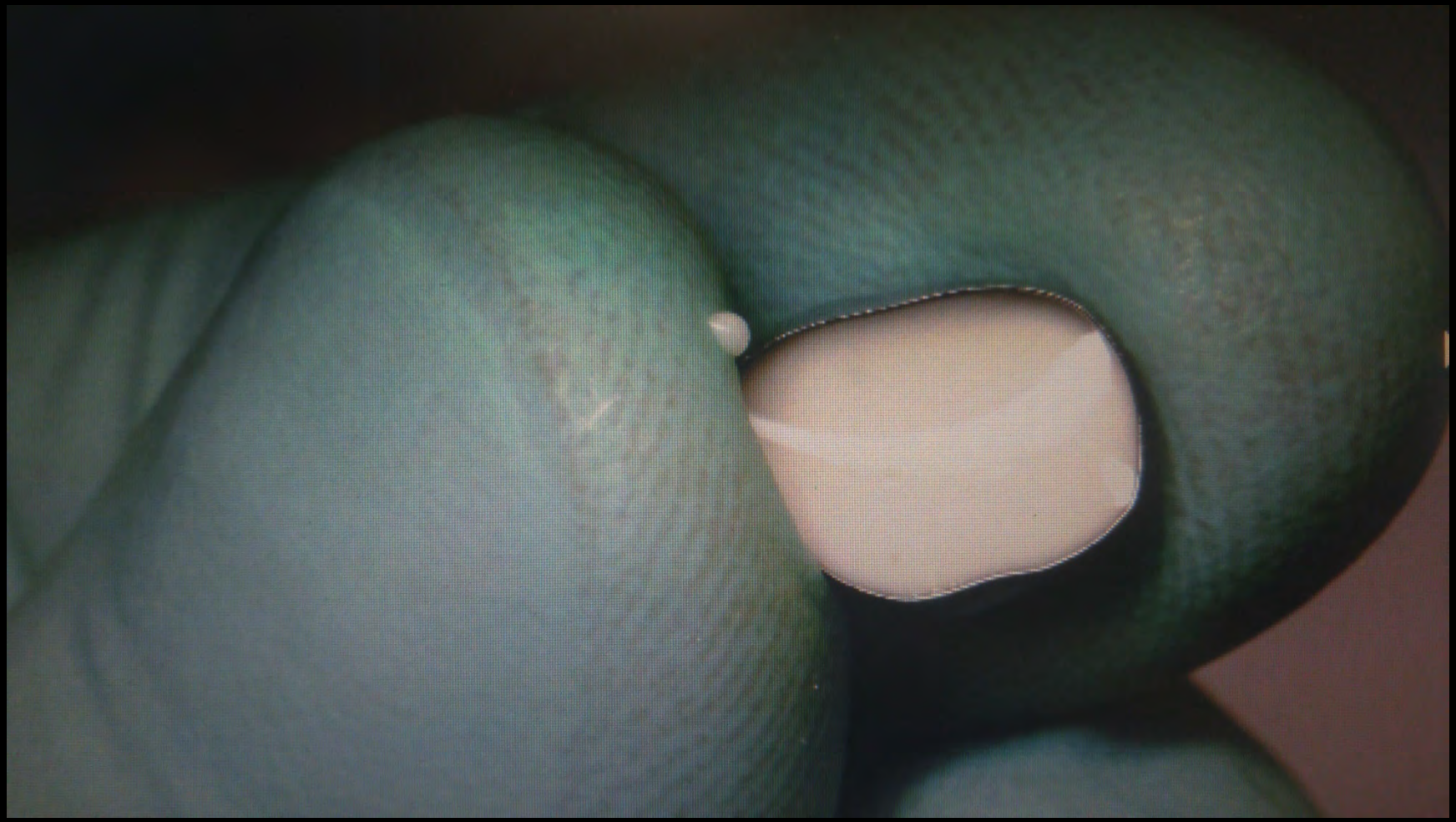
"97% of SSCs treated with the Hall technique were successful when compared with 94% of SSCs that were placed conventionally " (with aerosol)

"Also, of the SSCs placed with the Hall technique none resulted in harmful symptoms, whereas 5 of the SSCs placed by conventional means failed due to infection."

Test fit first

Use RMGI to cement Halls **(Fuji Cem Plus or FUJI Evolve)**
because it's creamy with low film thickness. Use only RMGIs with 80/20

Fill SSC completely to avoid bubbles or voids



Apply adequate pressure to seat Halls, then remove excess with cotton products , scalers or an explorer . Don’t lift crown with floss before RMGI sets, remove it sideways.

No light curing necessary because RMGI is dual-cure and plenty strong under an SSC without light curing . Self cured RMGI bonds tenaciously to SSCs + teeth

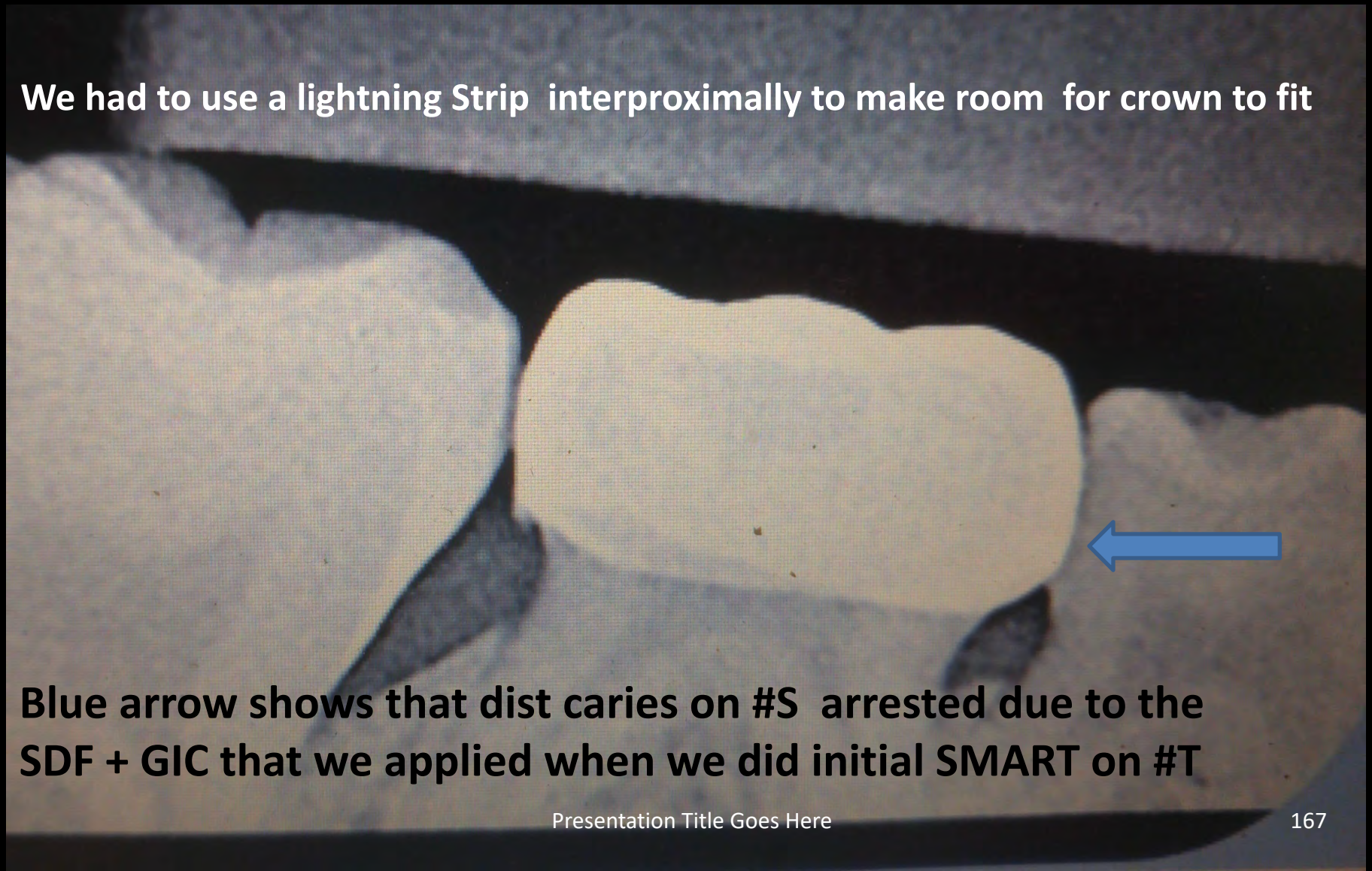
Hall Case study
Originally scheduled for hospital OR
Uncooperative 6 yo with caries on #T +S

Alternative to hospital: applied SDF, smeared GIC, knee-to-knee, patient cried and fussed , parent worked comfortably with us and we used **NO aerosol**

Knee-to-Knee: "The Dental Act of Love"

Often works much better than a dental chair because mom can lovingly assist

One yr later: patient became cooperative so we did a same-day SM Hall Crown: patient loved Tx



Hall Crown Case Study: 4yo, first dental appointment, requested no hospital because brother went to hospital and had terrible experience:

We did 4 SMART Halls

Four Halls done on her exam appointment which was her first ever dental appointment, no needles, no drills, no aerosol, no tears, max prevention

40 minutes.
Happy NOT to go to hospital

Another Hall Crown case: 5 YO with 4 badly decayed primary molars:
4 SMART Hall Crowns, no needles, no drills, no tears, no aerosol, 30 minutes Tx time

Glass Ionomer Sealants

A sealant is needed IMMEDIATELY but can't keep this tooth dry, not even with 4 hands. Resin sealants are the wrong choice here!

if GIC was placed when this tooth was even less erupted it could have prevented the decay you see here.

If you can't keep teeth dry, resin sealants won't work.

GIC is better in schools for hyper-active kids like these in an Alaskan Inupiaq village

We tried to place 4 -handed resin sealants in a waiting room on this special needs boy and were unsuccessful .

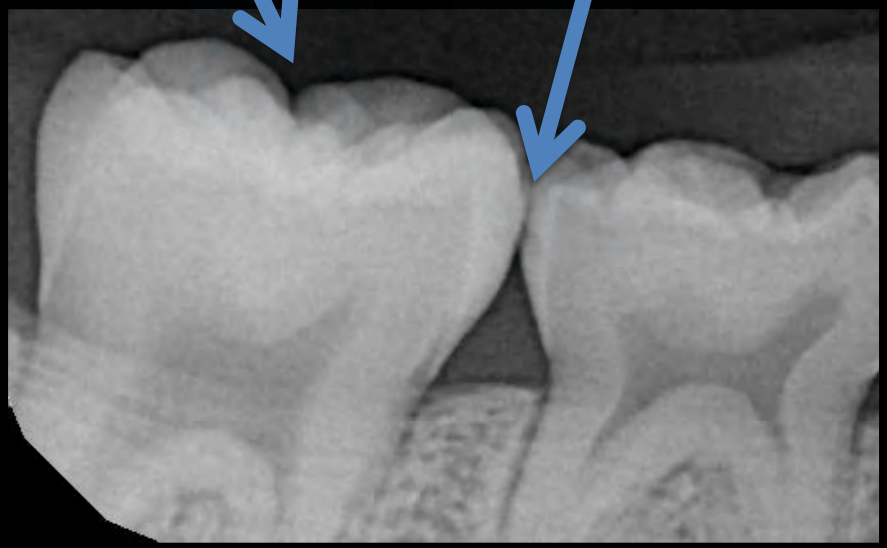
With GIC sealants we succeeded because **GIC sealants are less invasive, when placed with gloved fingers in a wet mouth and they create no aerosol!**

GIC sealants are **NOT** sub-standard!

- They release fluoride + minerals

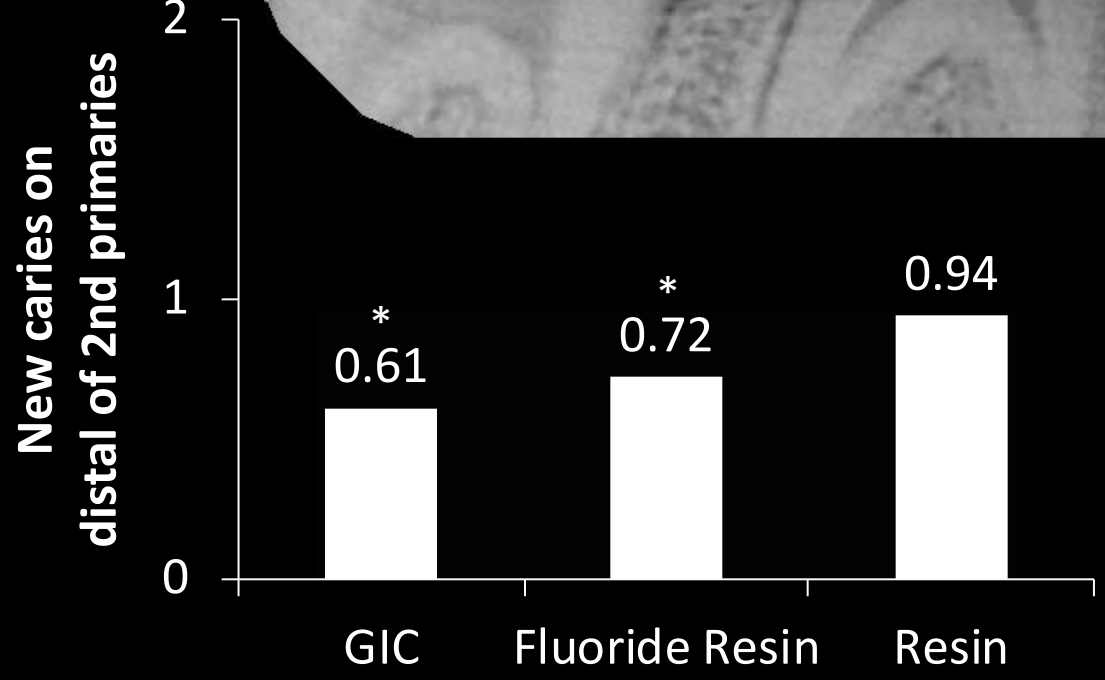
- They have lower technique sensitivity and…

Does GIC here **actually** **prevent caries here?**



YES !!

2,557 7yo's, studied for2.5 years in Italy



Cagetti et al., *J Dent Res* 2014

2016 GIC sealant Meta Analysis

"Caries-Preventive Effect of High-Viscosity Glass Ionomer and Resin-Based Fissure Sealants on Permanent Teeth: A Systematic Review of Clinical Trials"

Mickenautsch + Yengopal

-"Prevention of caries by glass ionomer sealants does not depend on bulk retention of the material. The glass ionomer releases fluoride and metal ions into the susceptible areas of pits and fissures, making the teeth at least as caries resistant as when a proper resin sealant is placed."

"Caries-Preventive Effect of a One-Time Application of Composite Resin and Glass Ionomer Sealants after 5 Years"

Beiruti , Frencken, van 't Hof, Taifour , vanPalenstein, Helderman

Caries Research, May 6, 2004

"We conclude that the caries-preventive effect of high viscosity glass ionomer sealants, placed according to the ART procedure, was between 3.1 and 4.5 times higher than that of composite resin sealants after 3–5 years. Furthermore, high-viscosity glass ionomer sealants appear to have a four times higher chance of preventing caries in pits and fissures of occlusal surfaces in first molars than is achieved using light-cured composite resin sealant material over a 1- to 3-year period

Public Knowledge:

How much longer can the scientific knowledge and benefits of patient-friendly MID/MMC be kept from the general public ?

As a widespread public health measure MID/MMC and SMART provide a higher standard of care

End of 2nd lecture

The FDA issued a serious warning against GA and sedation in kids 3 yrs and younger

2016: *"Repeated or lengthy use of general anesthetic and sedation drugs during surgeries or procedures in children younger than 3 years may affect the development of children's brains."*

What are the risks of not treating baby teeth at all?

No one has ever died from an infected baby tooth.

Sedation and GA is far more dangerous than a young child's biome gone awry.

2014

DrBicuspid.com

Hawaii girl died from drugs used during dental procedure

By DrBicuspid Staff

March 25, 2014 -- A 3-year-old Hawaii girl who died following e and likely died because of the drugs used to sedate her, according t

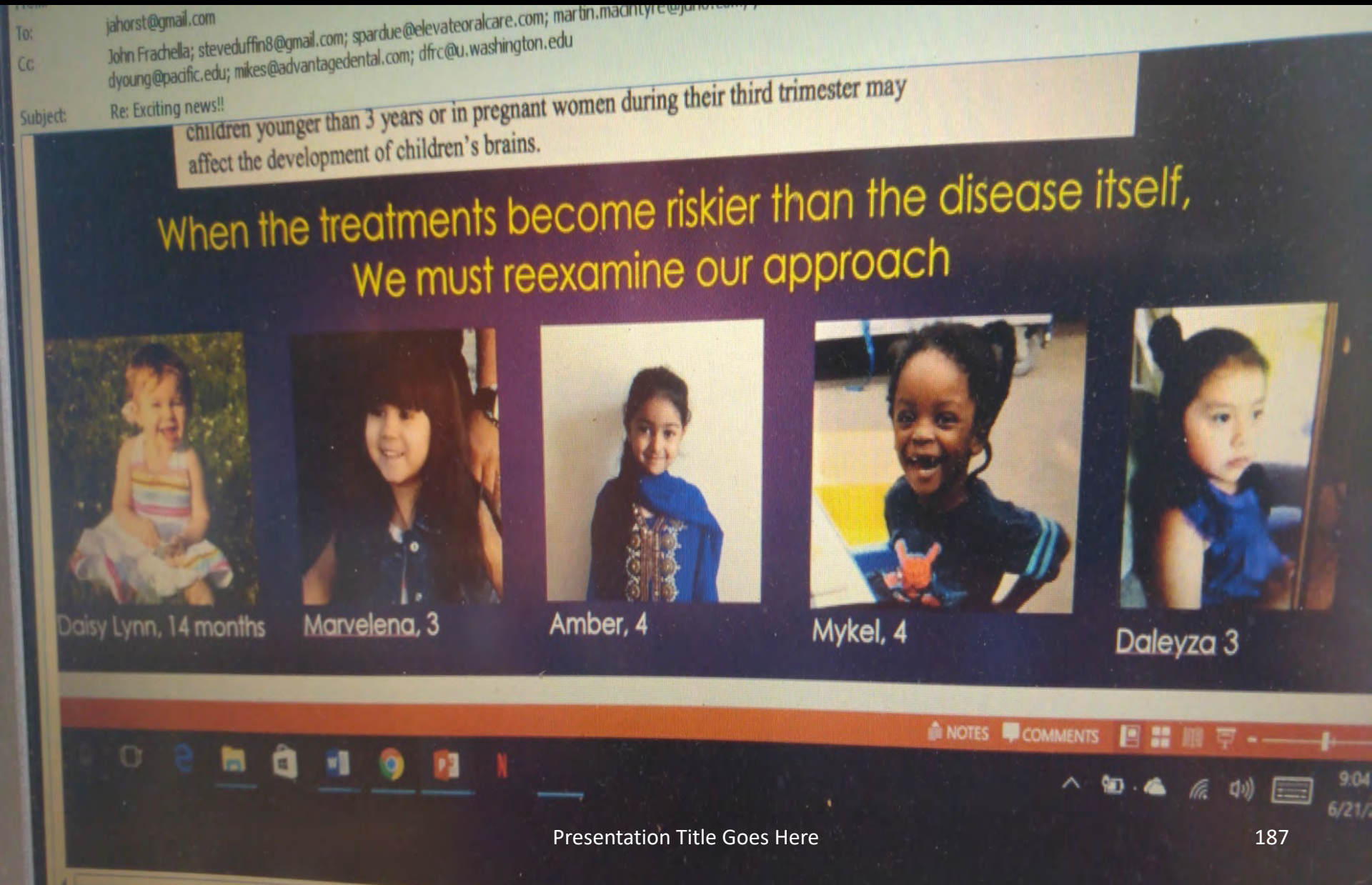
Finley Puleo Boyle went into cardiac arrest and lapsed into a co Lilly Geyer, DMD, a dentist at Island Dentistry for Children in Kailua. She died on January 3.

Honolulu Chief Medical Examiner Dr. Christopher Happy said the girl received five drugs in preparation for restorations and root canals: Demerol, hydroxyzine, chlorohydrate, nitrous oxide and a local anesthetic, lidocaine with epinephrine, according to a nydailynews.com story.

Following the lidocaine injection, the girl became unresponsive and went into cardiopulmonary arrest, according to the autopsy report.

Her parents have filed a medical negligence lawsuit, and Island Dentistry for Children has closed.

Repeated deaths under GA and sedation 2016



“Vancouver, WA 4-year-old dies after dental procedure” 2017 The Vancouver Sun

“ This office contracts with a board-certified anesthesiologist … Anesthesia and deep sedation was used in this location more than 1,900 times in the past three and a half years.”

After being reported one time, nothing more was said or heard again about this incident in any public forum.

Dental GA and sedation deaths are grossly under-reported

- Insurance companies pay families “hush money”.

- Then other innocent dentists continue to assume that referrals for sedation/GA remains a high standard that we should uphold.

2017 paper in *"Pediatrics"*

4-yo dies from Versed+N20 considered "mild sedation." He got 2 doses of Versed, the second one killed him

Ethics Rounds: Death After Pediatric Dental Anesthesia: An Avoidable Tragedy?

Helen Lee, MD, MPH,[a] Peter Milgrom, DDS,[b] Colleen E. Huebner, PhD, MPH,[c] Philip Weinstein, PhD,[b] Wylie Burke, MD, PhD,[d] Erika Blacksher, PhD,[d] John D. Lantos, MD[e]

Early childhood caries (ECC) is the single most common chronic childhood disease. In the treatment of ECC, children are often given moderate sedation or general anesthesia. An estimated 100 000 to 250 000 pediatric dental sedations are performed annually in the United States. The most common medications are benzodiazepines, opioids, local anesthetics, and nitrous oxide. All are associated with serious adverse events, including hypoxemia, respiratory depression, airway obstruction, and death. There is no mandated reporting of adverse events or deaths, so we don't know how often these occur. In this article, we present a case of a death after dental anesthesia and ask experts to speculate on how to improve the quality and safety of both the prevention and treatment of ECC.

[a]Department of Anesthesiology, College of Medicine, University of Illinois at Chicago, Chicago, Illinois; Departments of [b]Oral Health Sciences, [c]Health Services, and [d]Bioethics and Humanities, University of Washington, Seattle, Washington, and [e]Pediatric Critical Care

Are GA and sedation worth it when we can paint teeth with SDF to instantly arrest decay, prevent infection,
relieve pain and sensitivity,
and then do fillings later?

-

That does not mean we should take GA and sedation dentistry out of our tool kits.

It does mean that GA and sedation dentistry is NOT for every behaviorally challenged youngster on Medicaid!

- Our rule: postpone till patient is older than 3 Yo and if not possible keep GA to under 1 hour. Above all, do what we can to avoid it!

FV+ Povidone Iodine

Topical Iodine (Betadine)

- Protect eyes & clothes
- Dry teeth with gauze
- Paint all teeth front and back including biting surfaces
- Dry teeth again
- Apply fluoride varnish

Evidence for Povidone Iodine

- 12 to 19 mo toddlers, positive for mutans
- Applied 6 times in 12 months
- 91% caries free in treatment group
  - 54% caries free in control group

Lopez, Pediatr Dent.
2002;24(3):204-6.

Evidence for Povidone Iodine in children who received extensive restorative under GA

- Applied 3 times in 6 months
- 18% recurrent caries at 6 months in treatment group
- 63% recurrent caries in control grp

Pediatr Dent. 2004 JanFeb;26(1):5-10.

Children who received FV + Iodine

210% more likely to have caries-free permanent molars

than children who received Fl varnish alone

FV+Iodine vs. SDF alone in Older Adults

- RCT in 353 60+ year olds in Hong Kong
- FV+Iodine vs. 38% SDF q 4 mos
- At 12 mos mean new root caries lesions:
  - 0.7 in PVP-I group
  - 0.9 in SDF group

  NO SIGNIFICANT DIFFERENCE

J. Zhang et al. IADR 2019 presentation #0763

FV + Iodine clinical application on children : First dry the teeth

Apply the iodine with a cotton tip applicator

Apply fluoride varnish

Recommended Frequency of PI + FV applications:

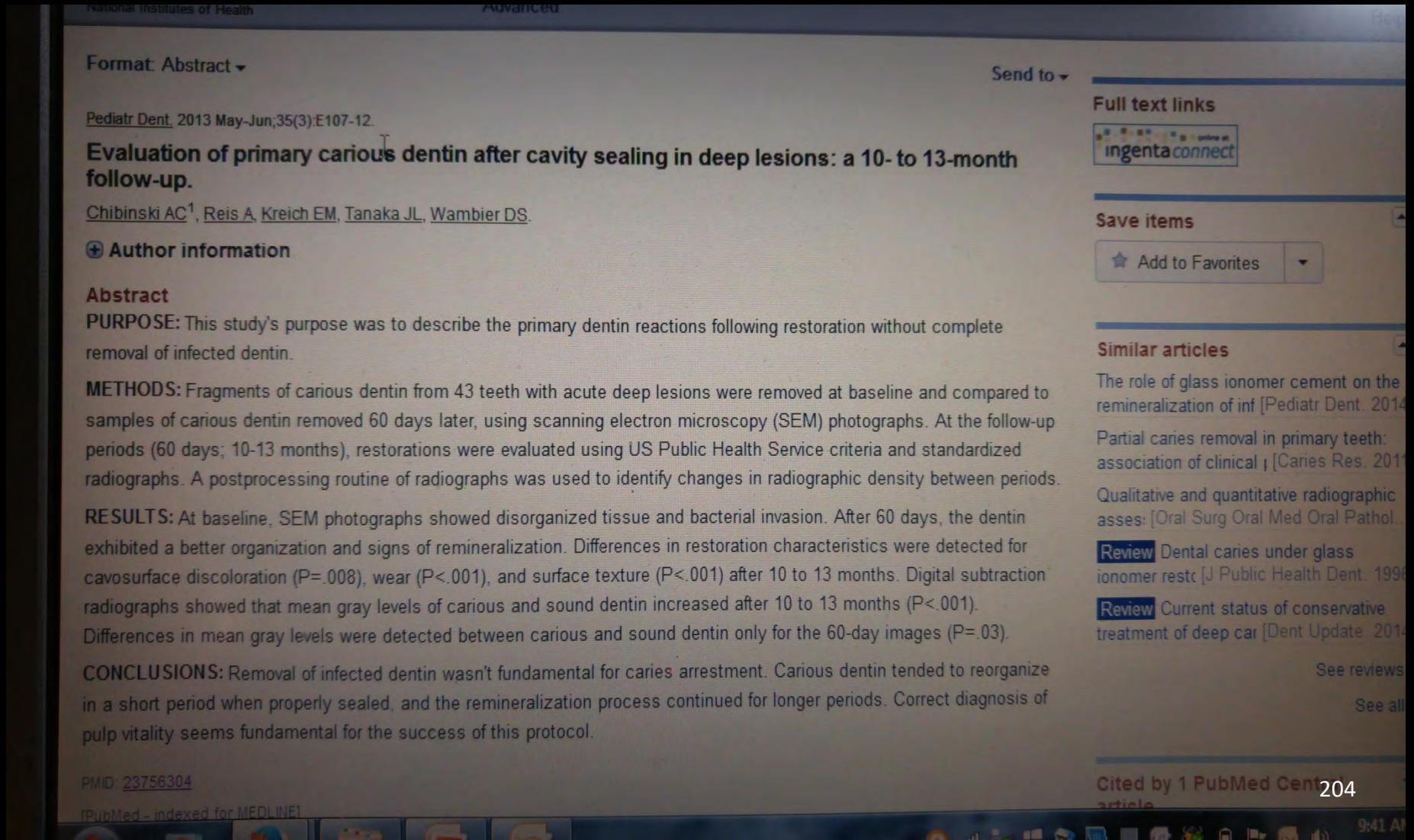
- Once a week for a month.

- Then once or twice per month depending upon caries activity.

(Dr. Jeremy Horst)

EVIDENCE FOR leaving decay partially or totally unexcavated,

“The removal of infected dentin isn’t fundamental for caries arrest” (Pediatr. Den. 2013)



Format: Abstract ▾ Send to ▾

Pediatr Dent. 2013 May-Jun;35(3):E107-12.

Evaluation of primary carious dentin after cavity sealing in deep lesions: a 10- to 13-month follow-up.

Chibinski AC[1], Reis A, Kreich EM, Tanaka JL, Wambier DS.

⊕ **Author information**

Abstract

PURPOSE: This study's purpose was to describe the primary dentin reactions following restoration without complete removal of infected dentin.

METHODS: Fragments of carious dentin from 43 teeth with acute deep lesions were removed at baseline and compared to samples of carious dentin removed 60 days later, using scanning electron microscopy (SEM) photographs. At the follow-up periods (60 days; 10-13 months), restorations were evaluated using US Public Health Service criteria and standardized radiographs. A postprocessing routine of radiographs was used to identify changes in radiographic density between periods.

RESULTS: At baseline, SEM photographs showed disorganized tissue and bacterial invasion. After 60 days, the dentin exhibited a better organization and signs of remineralization. Differences in restoration characteristics were detected for cavosurface discoloration (P=.008), wear (P<.001), and surface texture (P<.001) after 10 to 13 months. Digital subtraction radiographs showed that mean gray levels of carious and sound dentin increased after 10 to 13 months (P<.001). Differences in mean gray levels were detected between carious and sound dentin only for the 60-day images (P=.03).

CONCLUSIONS: Removal of infected dentin wasn't fundamental for caries arrestment. Carious dentin tended to reorganize in a short period when properly sealed, and the remineralization process continued for longer periods. Correct diagnosis of pulp vitality seems fundamental for the success of this protocol.

PMID: 23756304

[PubMed - indexed for MEDLINE]

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Review Current status of conservative treatment of deep car [Dent Update. 201

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…removing all vestiges of infected dentin is not required for caries management" (JADA 2008)

Treatment of deep carious lesions by complete excavation or partial removal

A critical review

Van Thompson, DDS, PhD; Ronald G. Craig, DMD, PhD; Fredrick A. Curro, DMD, PhD; William S. Green, AB; Jonathan A. Ship, DMD

The treatment of deep carious lesions approaching a healthy pulp presents a significant challenge to the practitioner. The traditional management of carious lesions of any kind dictates the removal of all infected and affected dentin to prevent further cariogenic activity and provide a well-mineralized base of dentin for restoration. When the procedure risks exposing or even breaching the pulp, however, the course of treatment becomes less predictable and may require such measures as indirect pulp capping (typically using a protective material such as a calcium hydroxide–based preparation), pulpotomy or, in the most extreme cases, pulpectomy. Choosing among these options can be daunting for the dentist—as well as for the patient, who is advised of the risks and asked to share in the decision.

To preclude or at least minimize the potential complications of com-

ABSTRACT

Background. The classical approach to treatment of deep carious lesions approaching the pulp mandates removing all infected and affected dentin. Several studies call this approach into question.

Types of Studies Reviewed. A search of five electronic databases using selected key words to identify studies relating to partial versus complete removal of carious lesions yielded 1,059 reports, of which the authors judged 23 to be relevant. Three articles reported the results of randomized controlled trials.

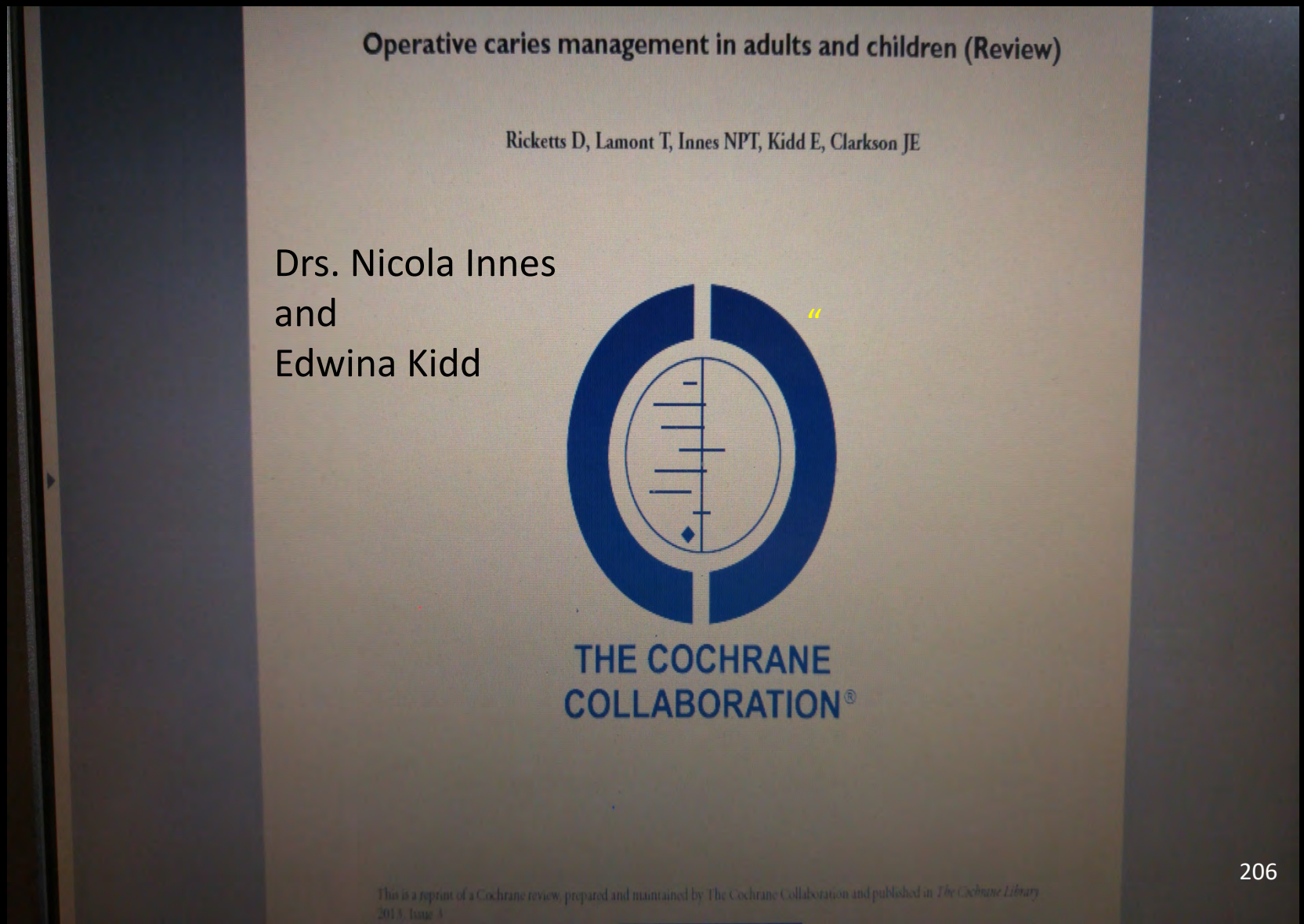
Results. The results of three randomized controlled trials, one of which followed up patients for 10 years, provide strong evidence for the advisability of leaving behind infected dentin, the removal of which would put the pulp at risk of exposure. Several additional studies have demonstrated that cariogenic bacteria, once isolated from their source of nutrition by a restoration of sufficient integrity, either die or remain dormant and thus pose no risk to the health of the dentition.

Clinical Implications. There is substantial evidence that removing all vestiges of infected dentin from lesions approaching the pulp is not required for caries management.

Key Words. Deep caries; deep carious lesions; partial caries removal; indirect pulp capping; pulpal exposure; stepwise excavation; alternative restorative treatment.

JADA 2008;139(6):705-712.

“There are clinical advantages to leaving caries partially unexcavated” (Cochrane Review 2013)



"Bacterially contaminated or de-mineralized tissues close to the pulp do not need to be removed" (Advances in Dent Res, 2016)

Advances in Dental Research
2016, Vol. 28(2) 58–67

DOI: 10.1177/0022034516639271
adr.sagepub.com

Managing Carious Lesions: Consensus Recommendations on Carious Tissue Removal

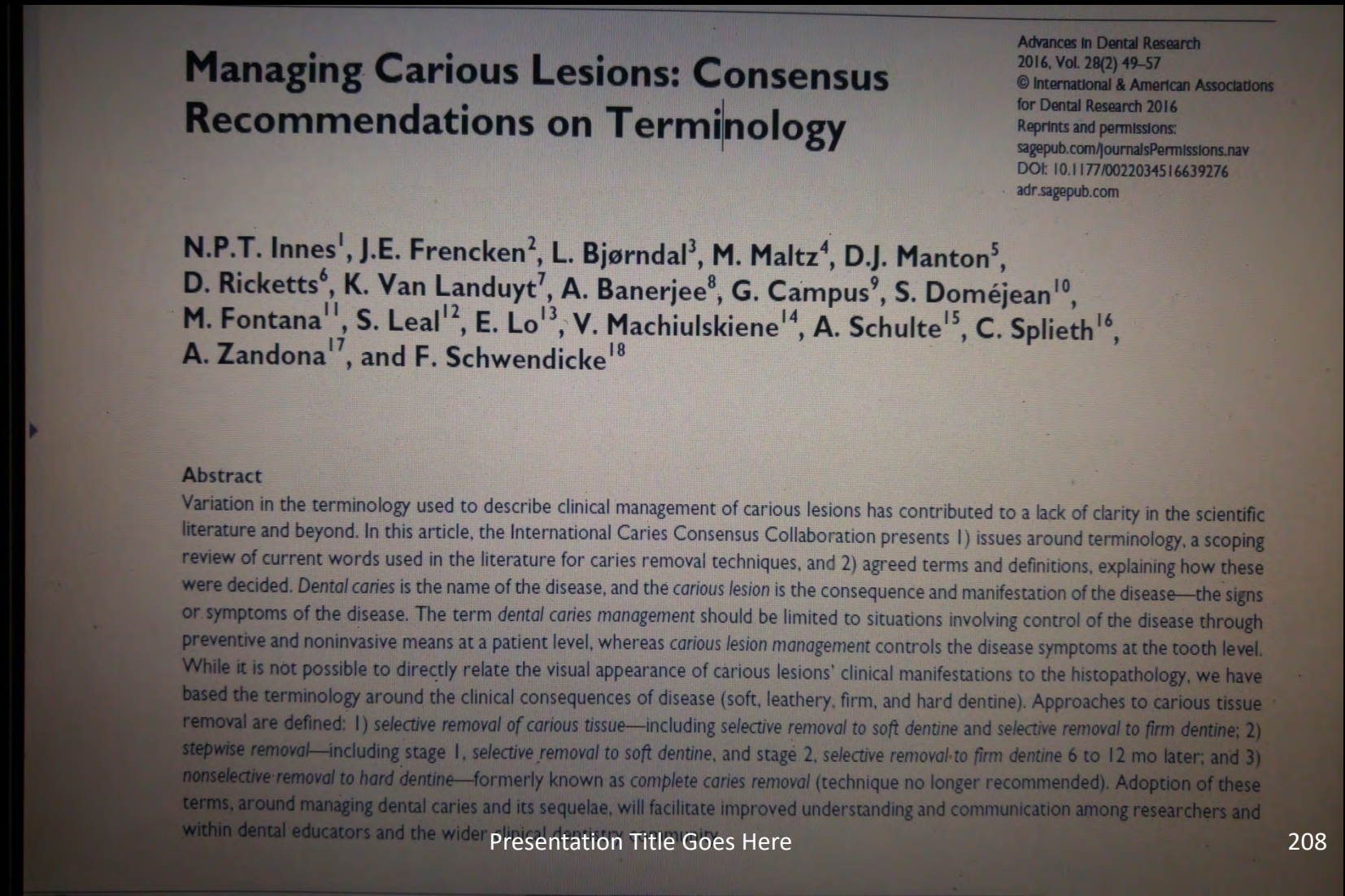
F. Schwendicke[1], J.E. Frencken[2], L. Bjørndal[3], M. Maltz[4], D.J. Manton[5], D. Ricketts[6], K. Van Landuyt[7], A. Banerjee[8], G. Campus[9], S. Doméjean[10], M. Fontana[11], S. Leal[12], E. Lo[13], V. Machiulskiene[14], A. Schulte[15], C. Splieth[16], A.F. Zandona[17], and N.P.T. Innes[18]

Frencken, Fontana, Innes study

Abstract

The International Caries Consensus Collaboration undertook a consensus process and here presents clinical recommendations for carious tissue removal and managing cavitated carious lesions, including restoration, based on texture of demineralized dentine. Dentists should manage the disease dental caries and control activity of existing cavitated lesions to preserve hard tissues and retain teeth long-term. Entering the restorative cycle should be avoided as far as possible. Controlling the disease in cavitated carious lesions should be attempted using methods which are aimed at biofilm removal or control first. Only when cavitated carious lesions either are noncleansable or can no longer be sealed are restorative interventions indicated. When a restoration is indicated, the priorities are as follows: preserving healthy and remineralizable tissue, achieving a restorative seal, maintaining pulpal health, and maximizing restoration success. Carious tissue is removed purely to create conditions for long-lasting restorations. Bacterially contaminated or demineralized tissues close to the pulp do not need to be removed. In deeper lesions in teeth with sensible (vital) pulps, preserving pulpal health should be prioritized, while in shallow or moderately deep lesions, restoration longevity becomes more important. For teeth with shallow or moderately deep cavitated lesions, carious tissue removal is performed according to *selective removal to firm dentine*. In deep cavitated lesions in primary or permanent teeth, *selective removal to soft dentine* should be performed, although in permanent teeth, *stepwise removal* is an option. The evidence and, therefore, these recommendations support less invasive carious lesion management, delaying entry to, and slowing down, the restorative cycle by preserving tooth tissue and retaining teeth long-term.

"…complete caries removal technique is no longer recommended…" (Advances in Dent Res, 2016)



Managing Carious Lesions: Consensus Recommendations on Terminology

Advances in Dental Research
2016, Vol. 28(2) 49–57

DOI: 10.1177/0022034516639276
adr.sagepub.com

N.P.T. Innes[1], J.E. Frencken[2], L. Bjørndal[3], M. Maltz[4], D.J. Manton[5], D. Ricketts[6], K. Van Landuyt[7], A. Banerjee[8], G. Campus[9], S. Doméjean[10], M. Fontana[11], S. Leal[12], E. Lo[13], V. Machiulskiene[14], A. Schulte[15], C. Splieth[16], A. Zandona[17], and F. Schwendicke[18]

Abstract

Variation in the terminology used to describe clinical management of carious lesions has contributed to a lack of clarity in the scientific literature and beyond. In this article, the International Caries Consensus Collaboration presents 1) issues around terminology, a scoping review of current words used in the literature for caries removal techniques, and 2) agreed terms and definitions, explaining how these were decided. *Dental caries* is the name of the disease, and the *carious lesion* is the consequence and manifestation of the disease—the signs or symptoms of the disease. The term *dental caries management* should be limited to situations involving control of the disease through preventive and noninvasive means at a patient level, whereas *carious lesion management* controls the disease symptoms at the tooth level. While it is not possible to directly relate the visual appearance of carious lesions' clinical manifestations to the histopathology, we have based the terminology around the clinical consequences of disease (soft, leathery, firm, and hard dentine). Approaches to carious tissue removal are defined: 1) *selective removal of carious tissue*—including *selective removal to soft dentine* and *selective removal to firm dentine*; 2) *stepwise removal*—including stage 1, *selective removal to soft dentine*, and stage 2, *selective removal to firm dentine* 6 to 12 mo later; and 3) *nonselective removal to hard dentine*—formerly known as *complete caries removal* (technique no longer recommended). Adoption of these terms, around managing dental caries and its sequelae, will facilitate improved understanding and communication among researchers and within dental educators and the wider clinical [illegible]

We also have high levels of evidence proving that …

GIC re-mineralizes aggressively and deters decay-causing microbes…

Modern glass ionomer cement restorative materials have recently been classified as "composites" because they are a composition of minerals and materials

But glass-ionomers are also "medicines"

- Nothing on earth is more tooth-like than Glass
- GI re-mineralizes leathery dentin vigorously
- GI is highly anti-bacterial
- All the mineral ions that are in glass are also in teeth (Calcium, Phosphorous, Potassium, Fluoride and even Strontium and Aluminum)

JOURNAL OF DENTISTRY 34 (2006) 608–613

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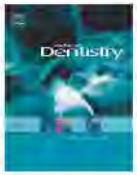
journal homepage: www.intl.elsevierhealth.com/journals/jden



Chemical exchange between glass-ionomer restorations and residual carious dentine in permanent molars: An in vivo study

Hien C. Ngo[a,*], Graham Mount[a], John Mc Intyre[a], J. Tuisuva[b], R.J. Von Doussa[a]

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ABSTRACT

Objective: To evaluate the remineralization of carious dentine following the restoration of an extensive lesion in a permanent molar with a high strength glass-ionomer cement (GIC).
Materials and methods: Thirteen first permanent molars, which were scheduled for extraction because of the presence of extensive caries lesions, were selected for this study. They were first restored, according to the ART technique, using encapsulated Fuji IX$_{GP}$, which contains a strontium glass rather than the traditional calcium glass. The cavities were prepared with a clean enamel margin and minimal removal of the carious dentine around the walls. After a period of 1–3 months they were harvested and subsequently sectioned and examined using an electron probe microanalysis (EPMA) and scanning electron microscopy (SEM).
Results: EPMA demonstrated that both fluorine and strontium ions had penetrated deep into the underlying demineralized dentine. The only possible source of these ions was the GIC restoration.
Conclusion: The pattern of penetration of the fluorine and strontium ions into the dentine was consistent with a remineralization process.

1. Introduction

Since the time of Dr. G.V. Black the profession has been taught to completely remove softened and discoloured dentine to eliminate infected tissue and create a hard foundation to support a proposed restoration. The suggested routine has been to remove all demineralized dentine, using aggressive hand instrumentation or a round bur, until sound, normal dentine formed the entire pulpal floor. The objective was to ensure the elimination of all remaining microorganisms thus eliminating a possible recurrence of caries. However, Lager et al. showed that this is not always successful and some microorganisms may remain even after all softened dentine has been removed and the cavity treated with sodium hypochlorite.[1] The main risk with this traditional approach is the possible accidental exposure of the pulp, particularly in young patients, where the rate of pulp exposure following excavation of large carious lesions in permanent molars has been rated at 40%.[2]

A step-wise excavation technique was introduced by Bodecker[3] designed to decrease the risk of mechanical pulp exposure. Bodecker recommended partial removal of the soft demineralized dentine on the cavity floor followed by immediate restoration with a temporary material such as zinc oxide/eugenol. The transitional material was expected to remain for a brief period of weeks and then replaced with

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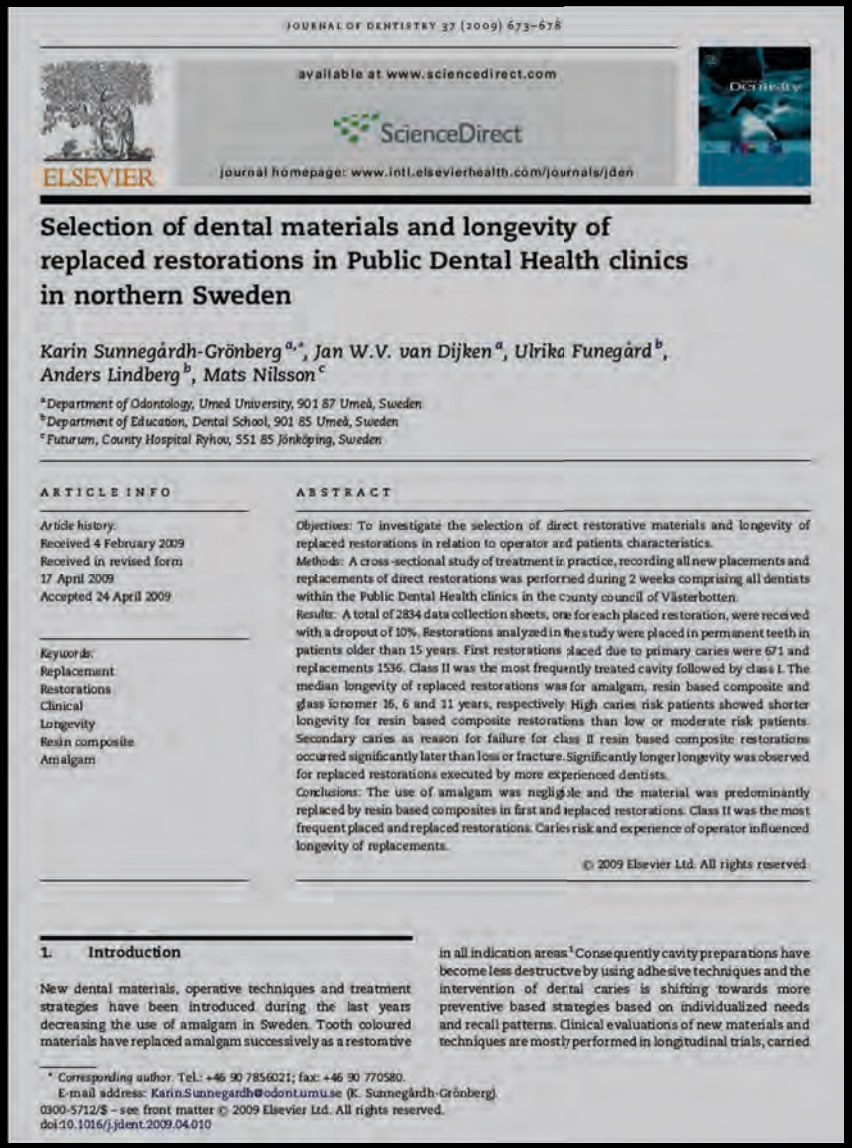
The Re-Mineralization Power of GIC

(Jour Dent Research 2005)

"Electron probe microanalysis demonstrated that fluorine and strontium ions from GIC penetrated deep into underlying demineralized dentin. The pattern is consistent with remineralization. The only source of these ions was the glass ionomer restoration."

The Longevity of GIC (Jour Den Research 2009)



JOURNAL OF DENTISTRY 37 (2009) 673–678

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journal homepage: www.intl.elsevierhealth.com/journals/jden

Selection of dental materials and longevity of replaced restorations in Public Dental Health clinics in northern Sweden

Karin Sunnegårdh-Grönberg [a,*], *Jan W.V. van Dijken* [a], *Ulrika Funegård* [b], *Anders Lindberg* [b], *Mats Nilsson* [c]

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Amalgam

ABSTRACT

Objectives: To investigate the selection of direct restorative materials and longevity of replaced restorations in relation to operator and patients characteristics.
Methods: A cross-sectional study of treatment in practice, recording all new placements and replacements of direct restorations was performed during 2 weeks comprising all dentists within the Public Dental Health clinics in the county council of Västerbotten.
Results: A total of 2834 data collection sheets, one for each placed restoration, were received with a dropout of 10%. Restorations analyzed in the study were placed in permanent teeth in patients older than 15 years. First restorations placed due to primary caries were 671 and replacements 1536. Class II was the most frequently treated cavity followed by class I. The median longevity of replaced restorations was for amalgam, resin based composite and glass ionomer 16, 6 and 11 years, respectively. High caries risk patients showed shorter longevity for resin based composite restorations than low or moderate risk patients. Secondary caries as reason for failure for class II resin based composite restorations occurred significantly later than loss or fracture. Significantly longer longevity was observed for replaced restorations executed by more experienced dentists.
Conclusions: The use of amalgam was negligible and the material was predominantly replaced by resin based composites in first and replaced restorations. Class II was the most frequent placed and replaced restorations. Caries risk and experience of operator influenced longevity of replacements.

1. Introduction

New dental materials, operative techniques and treatment strategies have been introduced during the last years decreasing the use of amalgam in Sweden. Tooth coloured materials have replaced amalgam successively as a restorative in all indication areas.[1] Consequently cavity preparations have become less destructve by using adhesive techniques and the intervention of dental caries is shifting towards more preventive based strategies based on individualized needs and recall patterns. Clinical evaluations of new materials and techniques are mostly performed in longitudinal trials, carried

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-Resin composite has a lifespan of ~6 years

-Glass ionomer has a lifespan of ~11 years

Absence of carious lesions at margins of glass-ionomer and amalgam restorations: a meta-analysis

S. MICKENAUTSCH, V. YENGOPAL, S.C. LEAL*, L.B. OLIVEIRA**, A.C. BEZERRA*, M. BÖNECKER**

Abstract: Aim To report on the absence of carious lesions at margins of glass ionomer cement (GIC) and amalgam restorations. Methods Six Anglophone and 3 Lusophone databases were searched for articles up to 3 January 2008. Inclusion criteria for articles were: (i) title/abstracts relevant to topic; (ii) published in English, Portuguese or Spanish language; (iii) reporting on a randomized control trial. Exclusion criteria were: (i) insufficient random allocation of study subjects (ii) operator and subject not blinded, where appropriate; (iii) not all enrolled subjects accounted for at trial conclusion; (iv) subjects of both groups not followed up the same way. Articles were accepted only if they complied with all the criteria. Ten articles complied with the inclusion criteria and were selected for review. From these 4 were rejected and 6 articles reporting on 8 separate studies accepted. Due to aspects of heterogeneity, studies were sub-grouped before meta-analysis. Results Significantly less carious lesions were observed on single-surface GIC restorations in permanent teeth after 6 years as compared to restorations with amalgam (OR: 2.64 - CI 95% 1.59 – 5.03, p= 0.001). No studies investigating multiple-surface restorations on permanent teeth were identified. Studies investigating carious lesions at margins of restorations in primary teeth showed no difference between both materials after 3 and 8 years. Conclusions Carious lesions at margins of single-surface GIC restorations are less common than with amalgam fillings after 6 years in permanent teeth. No difference was observed in primary teeth. More trials are needed in order to confirm these results.

Key words: Glass ionomer cement; Amalgam; Caries; Meta-analysis

Introduction

Carious lesions associated with the margins of tooth restorations have previously been defined as recurrent or secondary caries [Mjör, 2005]. In recent years it has been suggested that placing a filling does not cure caries and that the "recurrence" of lesions on restoration margins results from neglecting to treat caries as disease before placing a restoration [White and Eakle, 2000]. Part of the treatment of caries is to encourage remineralisation in the cavity walls [Tyas et al., 2000]. Ten Cate and van Duinen [1995] have shown, in-situ, a hyper-remineralisation effect in demineralised tooth tissues bordering glass ionomer cement (GIC) type restorations. In contrast, tissues bordering amalgam showed further extensive demineralisation. The significant remineralisation potential of GIC has been ascribed to the release of fluoride ions, facilitated by a hydrophilic environment [Aasmussen et al., 2002]. In addition, the release of strontium by GIC and its diffusion into demineralised tooth tissue, thus further aiding remineralisation, has been observed [Ngo et al., 2006]. Several trials have compared the clinical success rates of GIC and amalgam restorations in vivo [Taifour et al., 2002; Rahimtoola and van Amerongen, 2002; Taifour et al., 2003; Mandari et al., 2003; Qvist et al., 2006; Francken et al., 2007]. During these trials marginal integrity, anatomic form, material loss at surface and carious lesions at the restoration margins were assessed. Qvist et al. [1990] established that carious lesions were the main cause of failures of amalgam restorations in permanent teeth. In contrast, it has been suggested that carious lesions are rarely the cause of GIC restoration failures [Mjör, 2005].

So far no meta-analysis has been conducted to this topic. One narrative review, lacking a systematic methodology for literature search and article inclusion- and exclusion criteria, concluded that the effect of fluoride release of materials, such as GIC,

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E-mail: ...@...

The Cariostatic Power of GI

(Eur J Paediatr Dent 2009)

Glass ionomer restorations have less recurrent decay than amalgam after six years in permanent teeth

Materials

Fluoride-Releasing Restorative Materials and Secondary Caries

John Hicks, DDS, MS, PhD, MD; Franklin Garcia-Godoy, DDS, MS; Kevin Donly, DDS, MS; and Catherine Flaitz, DDS, MS

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Catherine Flaitz, DDS, MS, is in the Division of Oral and Maxillofacial Pathology, and Department of Pediatric Dentistry, University of Texas-Houston Health Science Center, Dental Branch, Houston.

Acknowledgment

Sections of this paper have been published previously in *Dental Clinics of North America* and have been included in this article with permission of that periodical.

abstract

Secondary caries is responsible for 60 percent of all replacement restorations in the typical dental practice. Risk factors for secondary caries are similar to those for primary caries development. Unfortunately, it is not possible to accurately predict which patients are at risk for restoration failure. During the past several decades, fluoride-releasing dental materials have become a part of the dentist's armamentarium. Considerable fluoride is released during the setting reaction and for periods up to eight years following restoration placement. This released fluoride is readily taken up by the cavosurface tooth structure, as well as the enamel and root surfaces adjacent to the restoration. Resistance against caries along the cavosurface and the adjacent smooth surface has been show in both in vitro and in vivo studies. Fluoride-releasing dental materials provides for improved resistance against primary and secondary caries in coronal and root surfaces. Plaque and salivary fluoride levels are elevated to a level that facilitates remineralization. In addition, the fluoride released to dental plaque adversely affects the growth of lactobacilli and mutans streptococci by interference with bacterial enzyme systems. Fluoride recharging of these dental materials is readily achieved with fluoridated toothpastes, fluoride mouthrinses, and other sources of topical fluoride. This allows fluoride-releasing dental materials to act as intraoral fluoride

The preventive power of GIC

(J of CDA 2003)

"GI provides a caries protective effects for cavo as well as for adjacent surfaces"

American Journal of Dentistry, 2004

Research Article

In situ transformation of glass-ionomer into an enamel-like material

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ABSTRACT: ***Purpose:*** To assess the nature of clinically detectable alterations in glass-ionomer after long-term clinical service. ***Methods:*** In addition to clinical macro pictures, SEM was carried out on replicas and on two sectioned primary molars SEM-EDAX analysis was performed to determine chemical transformation in the glass-ionomer. Also with SEM-EDAX, the composition was determined of a partially removed half-year old sealant. ***Results:*** The clinically observed altered optical aspect and increased hardness could be related with surface structure changes as identified by SEM. The changed glass-ionomer showed a continuous integration with the adjacent enamel. The SEM-EDAX analysis revealed an increase of calcium and phosphorus in the surface layer, tentatively suggesting a sort of additional "mineralization" of the material. This phenomenon was only observed for restorations that had minimally 2-3 years *in vivo* dwell time. (*Am J Dent* 2004;17:223-227).

CLINICAL SIGNIFICANCE: Straightforward application of conventional glass-ionomer restorative materials can lead to the formation of an extremely hard, glassy material, which remains in the fissure as a hard, enamel-like structure well-integrated with the natural tooth.

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GI becomes enamel-like after2 years

Introduction

Thanks to their applicability under humid conditions and direct bonding to tooth enamel, inorganic glass-ionomers are practical alternatives for resin fissure sealing. Although bond strength of glass-ionomer to tooth structure is inferior to that of resin-based materials, the adaptation is reported to be superior.[1,2] However, a disadvantage of glass-ionomers is their declared low wear resistance, which causes the sealant to be

"After 8 weeks, the tooth-GIC interface remains molecularly linked and acid resistant even if the GIC is eventually lost"

Atlas Glass-Ionomer Cement, Mount and Ngo, 2002

…at all stages in the development of the caries process (even when there's cavitation), it is also possible for re-mineralization cycles to return.

The word “re-min” seems to have become displaced by the new word “bioactive”…..

Everyone's jumping on the "Bioctive" bandwagon:

Activa, Alkasite, ProRoot MTA Angelus ,NeoMTA, , Theracal , Theracem, Biodentin, Ceramir, BioCem, Cention N, Ceramir C+B, Beautifil, etc.

But these materials are not glass nor do they perform like GIC or RMGI

Everyone wants to “out-glass” glass itself but that has not yet happened.

Glass is still the gold standard for tooth and bone re-min.

In teeth, it delivers up to 35,000ppm Fl initially and as much as 20ppm for the first month

Plus, glass also contains phosphorous, calcium, potassium, strontium and even a bit of aluminum, all of which also exist in mineral-form in teeth and in bone.

Nothing on Earth is more tooth-like than glass

Since all restoratives have a finite longevity and since caries is a chronic disease, the notion that GIC is somehow “interim” is ridiculous.

SMART is Silver ART

ART is A-traumatic Restorative Treatment

Discovered in 1996 by Dr. Joe Frenken

In ART, no needles, some caries is removed, then GIC is applied, then done.

The World Health Organization

In 1998, the WHO recommended ART as the 1st line of defense for saving primary teeth worldwide!

STOP TREATING AFTER APPLYING SDF?

Caries is arrested, but cavitation remains leaving a “food trap”

SM-ART…

Fills the food trap + kills decay-causing microbes with silver ions, and provides a re-mineralizing GIC "mineral ion reservoir" for adjacent teeth

and does not fall out if done correctly

After doing SMART for 12 yrs I find:

SDF under GIC provides better outcomes than I experience with either of these medicines used alone and provides better outcomes than conventional treatments like composites

A better metric for success:

Decay-free teeth

not the retention in teeth of inert, non-medicinal restorative materials or sealants

Longevity of SMART?

Here's what's surprises me the most :

Silver ions and glass have equal- to or greater longevity than conventional restorations in my hands .

LONGEVITY: These are Same-Day prim and perm tooth SMARTs 2 yrs post op

Longevity: Perm and prim tooth Same-Day SMARTs 2 yrs post

For Class II lesions, SDF alone leaves this detail unaddressed:

Gum-aces perceived by patients as tooth-aches

Class II SMART:

1) Stops food impaction
2) Re-mineralizes,
3) De-sensitizes,
4) Arrests decay ON ALL SURFACES, even surfaces of adjacent teeth

Parents want SMART for themselves and for their kids because of no needles + no drills.

Dentists want SMART because it's anti-microbial, re-mineralizing and it lasts as long or longer than conventional restorations and prevents recurrent decay

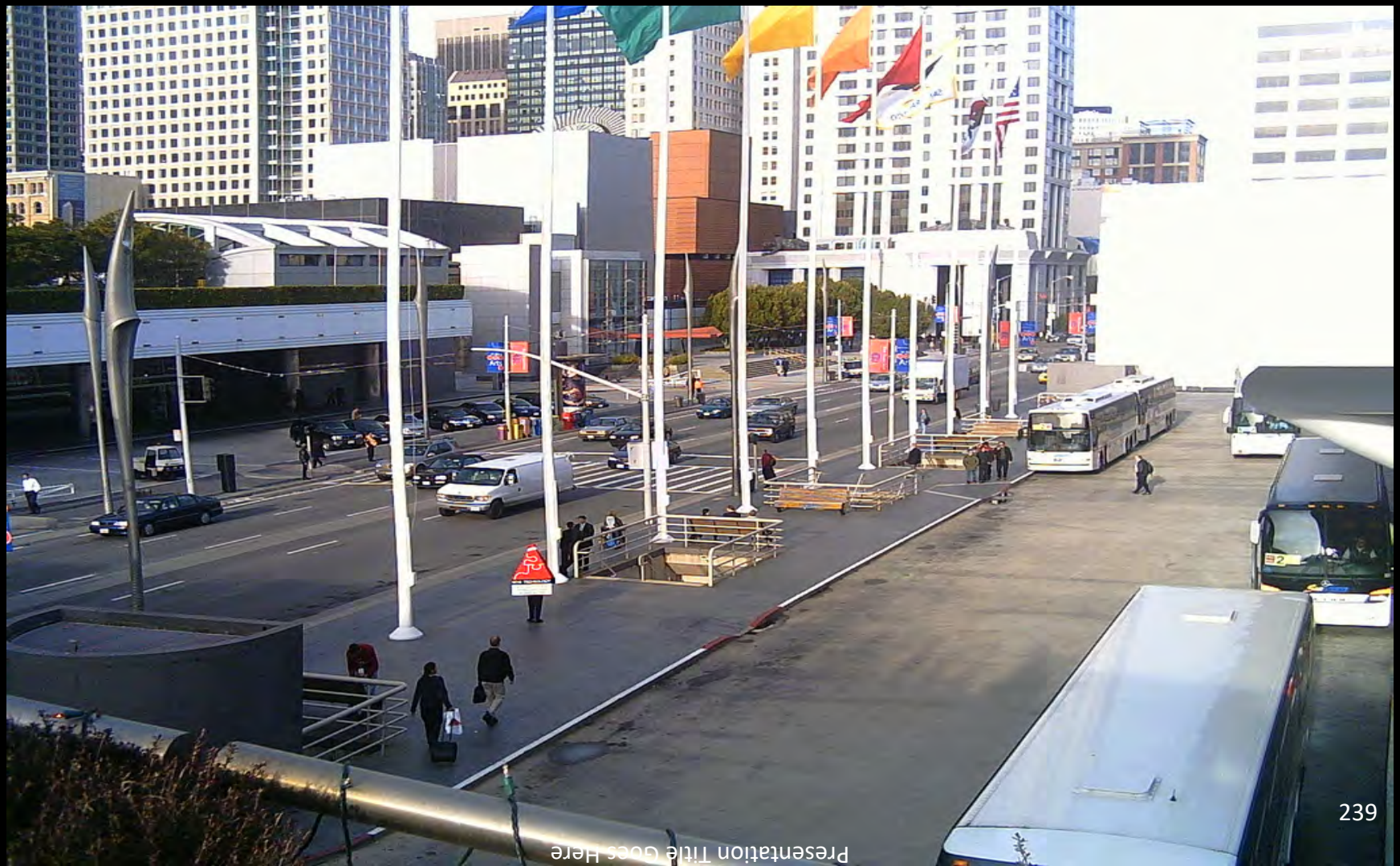
Alternative Venues
for providing SMART?

What if we provided **SMART at MOMs**?

Wouldn't it feel better to pat ourselves on the back as volunteers if we could treat all teeth at a MOM vs. treating only one tooth or one quad at a time?

“Street SMART”

Moscone Center,
San Francisco, IADR,
March 2017




Jeremy
On the stree
the venue fo
IADR Conve
Cate
Dr. Graham
Craig
John
Marcus

Why do this on the street?

To demonstrate that it's possible to provide various forms of SMART

(less ideal to more ideal)

almost anywhere,

in a painless, effective way

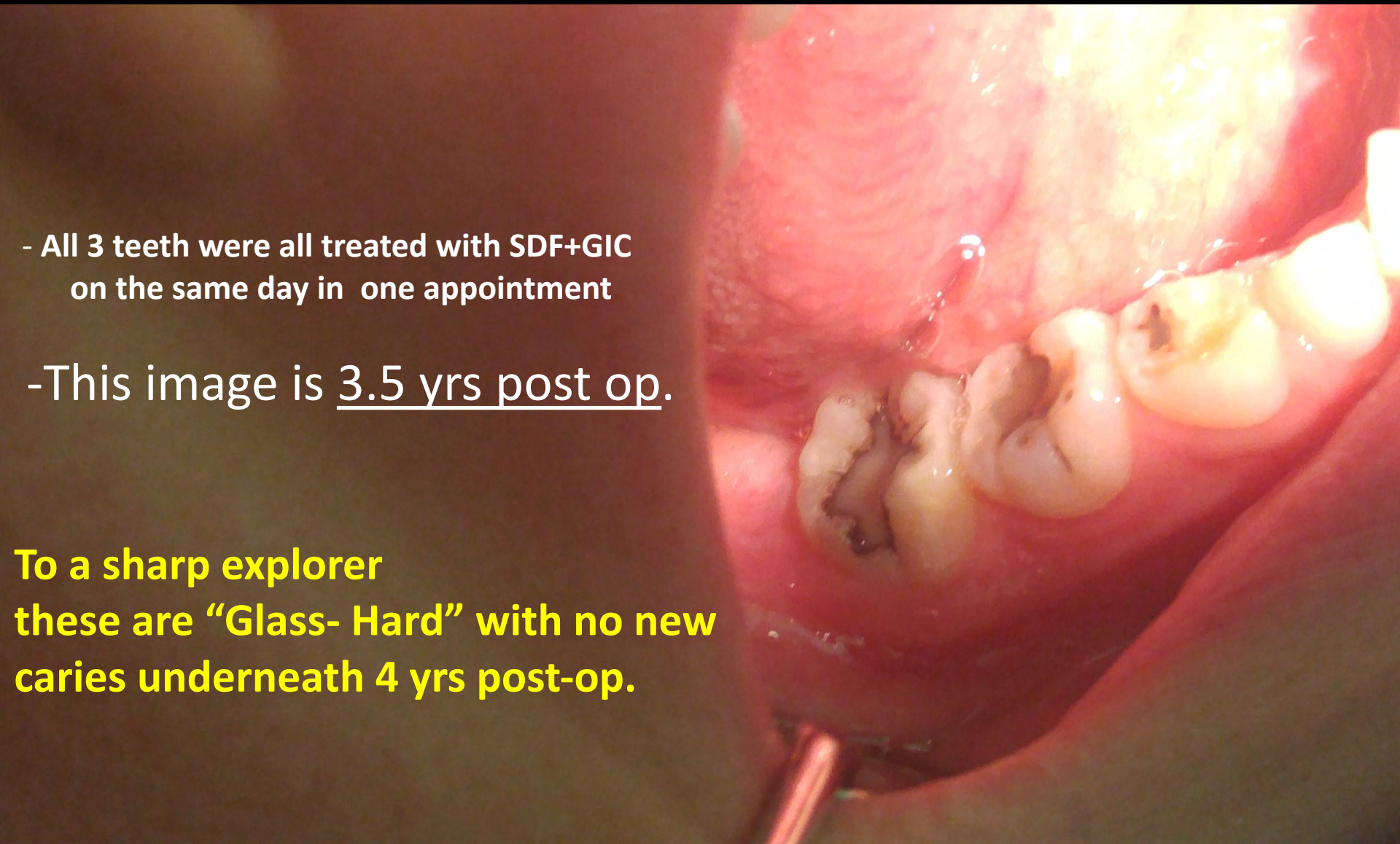
No matter where or how you work, SMART MEANS LESS EMERGENCY PHONE CALLS

SMART TODAY=LESS DISRUPTION of your schedule tomorrow because SDF and GIC control the disease by putting out the fire.

SMART kills decay-causing microbes, re-mineralizes and de-sensitizes

Does it ever make sense to treat a single lesion or a single quadrant of lesions while leaving other active lesions untreated --- when we can arrest all lesions immediately while also filling in food traps with SMART so that we can address the need for conventional restorations later if necessary ?

This is Same-Day SMART done on all carious teeth at a recall exam



- **All 3 teeth were all treated with SDF+GIC on the same day in one appointment**

-This image is 3.5 yrs post op.

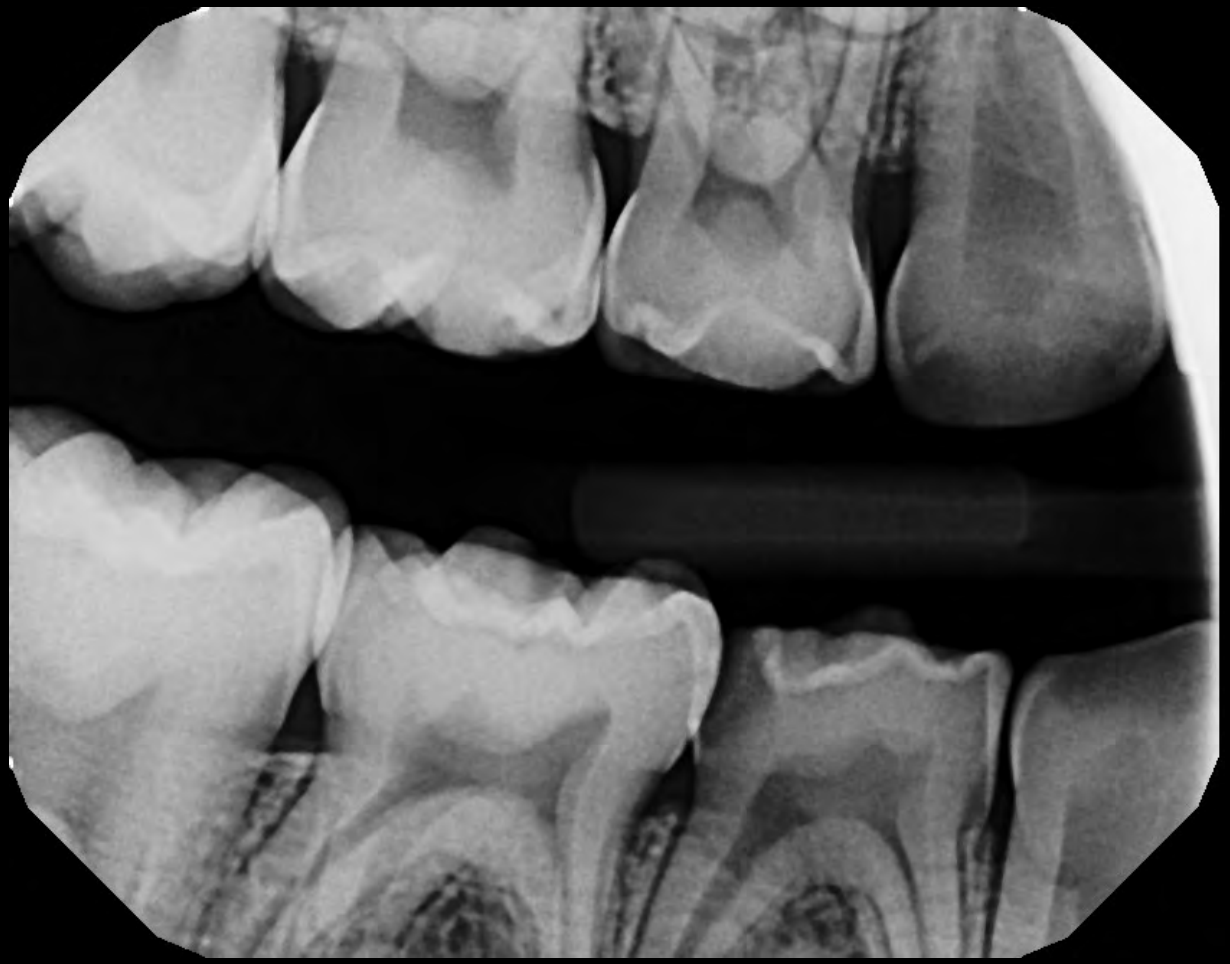
To a sharp explorer these are "Glass- Hard" with no new caries underneath 4 yrs post-op.

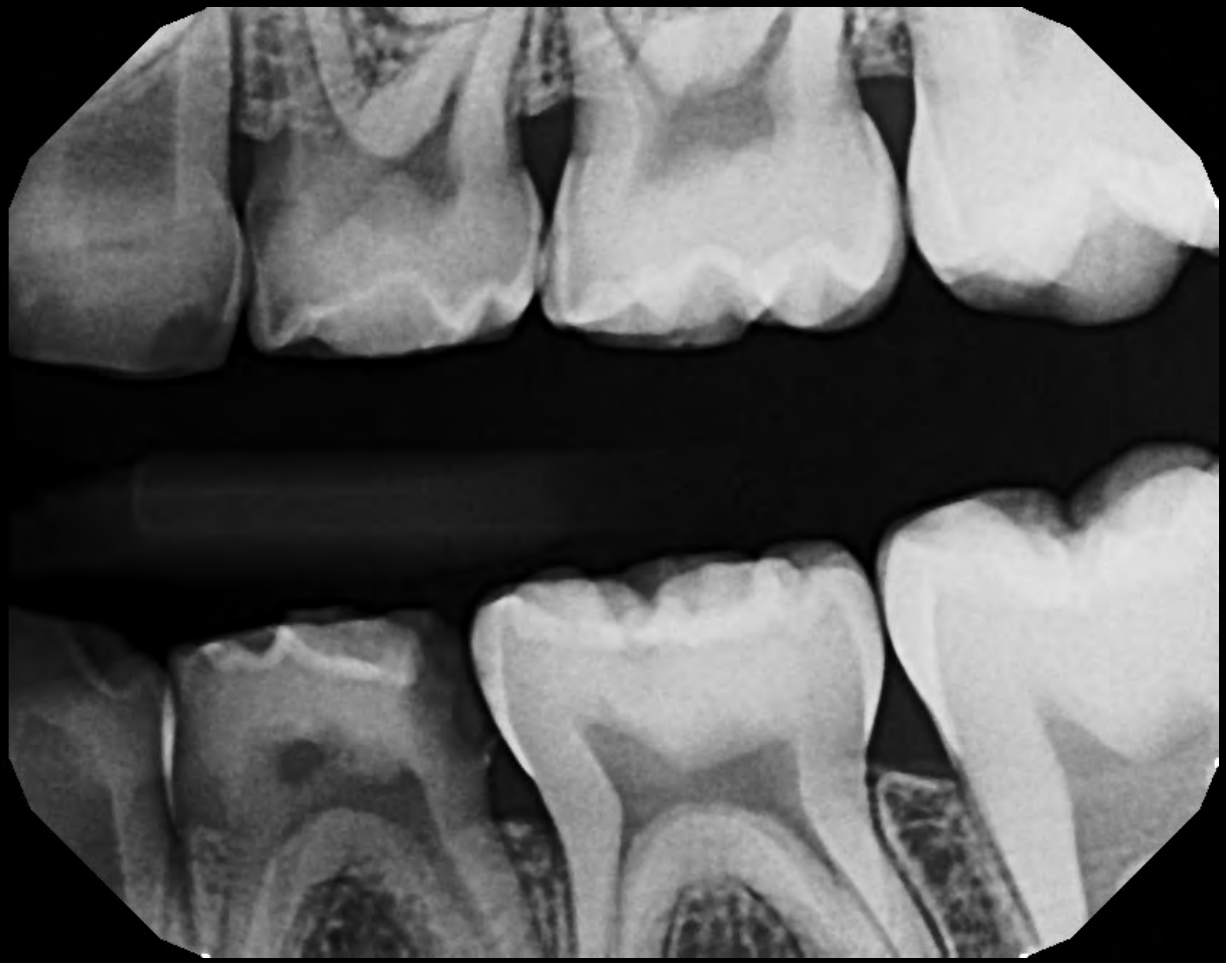
These Same-Day SMARTs were done during one recall appointment on all prim and perm posterior teeth on a 7 yo .

2 yrs post op image

She is now caries-free

Dr. Joe Hull





- *“ I saw this special needs boy for exam before I went out to see you. Decay in 3, 14, K, L, S, T. Medicaid. My original Tx plan was to treat K & L at the first appointment, then pulpotomy/SSC on #L, and OB composite on #K.*

- *After visiting you, I changed his treatment plan . Instead of treating K and L w/ local, and doing things as I have for years:*

- *#3- O smart fill*
- *#14- OL smart fill*
- *K- OB smart fill*
- *L- SDF + minimal prep/Hall crown (NO pulpotomy!)*
- *S- DO smart fill*
- *T- MO smart fill*

- *All carious lesions treated one visit. No local anesthesia. “*

- *Now this kid has no active caries and he had a very successful dental appt. He left happy and was not traumatized in any way; AND he now has 9 surfaces of GI as a reservoir of mineral content in his mouth.*

- *I felt a swell of emotion as I walked this kid out to the lobby. He and his mom may not fully realize the significance of what we did, but I do. His appointment will always be memorable to me as a major milestone in my career; a tremendous feeling of accomplishment.*

- *I have to say John, that I would not have changed this boy's treatment had I not come to visit you. I did the work, but it was your methods that I used; so by extension, you are now having an effect in South Dakota as well. Thanks very much.*

SMART Oral Health

The Medical Management of Caries

SMART DENTISTRY
A Textbook
Amazon Nov, 2019
$100

400 pages
Over 30 chapter authors
Over 60 chapters

End of 4^{th} hr Lecture