Dental Sealants in the COVID-19 World

Irene Hilton, DDS, MPH
Bill Maas, DDS, MS, MPH
Michelle Wright, RDH
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Objectives

1. Understand the rationale for sealants in the COVID-19 world.
2. Review the evidence base for applying sealants.
3. Present a technique for applying glass ionomer sealants with minimal aerosol generation.
NNOHA Receives 3-Year HRSA NTTAP Grant!

• 12 month QI Integration Collaborative
• 6 month Learning Community Collaboratives
  • Integration Behavioral & Oral Health (iBOH)
  • Teledentistry
  • UDS Sealants Measure Improvement
  • Workforce Recruitment & Retention
• Webinars, NNOHA conference, Best Practices, Publications
• 2020-21 funding for COVID T/TA
2019 UDS Data Due 02/15/2020

KEEP CALM
WE'LL REOPEN SOON
COVID and Dentistry Unknowns

• Individual and cumulative risk from general dental practice

• Individual and cumulative risk from Aerosol Generating Procedures

• % risk mitigation/reduction from engineering controls and work practices
Primary Care Mission and Strategies

*Improving the health of the Nation’s underserved communities and vulnerable populations by assuring access to comprehensive, culturally competent, quality primary health care services.*

- Increase access to primary health care services
- Modernize primary care infrastructure and delivery system
- Improve health outcomes and health equity
- Promote performance-driven, innovative organizations

Increase Value of Health Center Program

UDS Dental Sealant Measure
## National UDS Sealant Data

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>42.2%</td>
<td>48.7%</td>
<td>50.7%</td>
<td>52.8%</td>
<td>?</td>
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<td>Denominator</td>
<td>285,799</td>
<td>275,690</td>
<td>266,511</td>
<td>269,241</td>
<td>?</td>
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</table>
Disruption

• Prioritize procedures that prevent caries & future AGPs

Sealants More Important than EVER!!!!

• Eliminate useless AGPs ie. rubber cup prophy

• AGP-less dentistry ie. SDF, glass ionomer
Polling!

Have you placed sealants in the last week?

- Yes, we never closed or did not reduce services
- Yes, since re-opening
- No, since re-opening
- No, we are not open yet
Evidence Base for Use of Dental Sealants: Resin or Glass Ionomer

Bill Maas, DDS, MPH, MS
Control of Dental Caries
Watch or Seal?

Wait And Then Cavity Happens

OR

Applied sealant
When in Doubt? Seal or Restore?

• Even the smallest restorations required removal of much sound tooth tissue.
• Restorations do not make teeth stronger, and they markedly increase the likelihood that future restorations will be larger.
• Only the dentist can restore. They have nothing better to do?
Sealants are effective in preventing & arresting caries in primary & permanent molars, and could minimize the progression of non-cavitated occlusal carious lesions.

This was a STRONG recommendation, meaning that in most situations clinicians should follow the course of action suggested by the panel and only in a selected few circumstances may they need to deviate from it.

Evidence-based clinical practice guideline for the use of pit-and-fissure sealants

A report of the American Dental Association and the American Academy of Pediatric Dentistry

Pit-and-fissure sealants have been used for nearly 5 decades to prevent and control carious lesions on primary and permanent teeth. Sealants are still underused despite their documented efficacy and the availability of clinical practice guidelines. New sealant materials and techniques continue to evolve, and material selection has become a more important factor in decision-making. The American Dental Association (ADA) Council on Scientific Affairs and the American Academy of Pediatric Dentistry (AAPD) concluded that there is sufficient scientific evidence to support the use of pit and fissure sealants in primary and permanent teeth.

ABSTRACT

Background. This article presents evidence-based clinical recommendations for the use of pit-and-fissure sealant on the occlusal surfaces of primary and permanent molars in children and adolescents. A guideline panel convened by the American Dental Association (ADA) Council on Scientific Affairs and the American Academy of Pediatric Dentistry conducted a systematic review and formulated recommendations to address clinical questions in relation to the efficacy, retention, and potential side effects of sealants on prevention of dental caries; their efficacy compared with fluoride varnishes; and a head-to-head comparison of the different types of sealant materials used to prevent caries on pit and fissures of occlusal surfaces.

Types of Studies Reviewed. This is an update of the ADA 2018 recommendations on the use of pit-and-fissure sealants on the occlusal surfaces of primary and permanent molars. The authors conducted a systematic review in MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and other sources to identify randomized controlled trials reporting on the effect of sealants (available on the US market) when applied to the occlusal surfaces of primary and permanent molars. The authors used the Grading of Recommendations Assessment, Development, and Evaluation approach to assess the quality of the evidence and to move from the evidence to the decision.

Results. The guideline panel formulated 3 main recommendations. They concluded that sealants are effective in preventing and arresting pit and fissure carious lesions of primary and permanent molars in children and adolescents compared with the use of sealants or use of fluoride varnishes. They also concluded that sealants could minimize the progression of noncavitated occlusal carious lesions in children and adolescents. The panel was unable to provide specific recommendations on the relative merits of the different types of sealant materials.

Conclusions and Practical Implications. These recommendations are designed to inform practitioners during the clinical decision-making process in relation to the prevention of occlusal carious lesions in children and adolescents. Clinicians are encouraged to discuss the information in this guideline with patients and their parents.

JADA 2016:147(8):672-682
Summary of ADA & AAPD Recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Quality of Evidence</th>
<th>Strength of Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sealant guideline panel recommends the use of sealants compared to non-use in permanent molars with both sound occlusal surfaces and non-cavitated occlusal caries lesions in children and adolescents.</td>
<td>Moderate</td>
<td>Strong</td>
</tr>
<tr>
<td>The sealant guideline panel suggests the use of sealants compared to fluoride varnishes in permanent molars with both occlusal sound surfaces and non-cavitated occlusal caries lesions in children and adolescents.</td>
<td>Low</td>
<td>Conditional</td>
</tr>
<tr>
<td>The panel was unable to determine superiority of one type of sealant over another due to the very low quality of evidence for comparative studies. The panel recommends that any of the materials evaluated (e.g., resin-based sealants, resin-modified glass ionomer sealants, glass ionomer cements, and polyacid-modified resin sealants in no particular order) can be used for application in permanent molars with both occlusal sound surfaces and non-cavitated occlusal caries lesions in children and adolescents.</td>
<td>Very Low</td>
<td>Conditional</td>
</tr>
</tbody>
</table>

If 100 Children Do Not Receive Sealants

- 50 children will have caries
- 50 children will not have caries

76% Reduction in Caries

If 100 Children Do Receive Sealants

- 12 children will have caries
- 38 children will be caries free due to sealant application
- 50 children will not have caries

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Systematic Reviews and Guidelines

- ADA Guidelines for Non-Restorative Treatment of Carious Lesions (JADA, Oct 2018)
- **ADA & AAPD Guidelines for Sealants** (JADA, Aug 2016)
- ADA & AAPD Systematic Review of RCTs (JADA Aug 2016)

Also

Guideline to Arrest Caries on Permanent Teeth

- **Noncavitated**
  - **Sealants plus 5% NaF varnish** or sealants alone
    - 5% NaF varnish or 1.23% APF gel or 0.2% NaF mouth rinse
    - 38% SDF solution

- **Cavitated**
  - 5% NaF varnish or resin infiltration alone or resin infiltration plus 5% NaF varnish or sealants alone
  - 1.23% APF gel or 5% NaF varnish
  - 5,000 parts per million fluoride (1.1% NaF toothpaste or gel)

- **Noncavitated** and cavitated
  - 5% NaF varnish or 38% SDF solution plus potassium iodide or 38% solution SDF alone or 1% chlorhexidine plus 1% thymol varnish

Lesions should be monitored (for example, hardness or texture, color, radiographs) periodically throughout the course of treatment.
Evidence-based Guideline on Non-restorative Treatments for Carious Lesions

Recommendations for the arrest or reversal of noncavitated or cavitated dental caries using non-restorative treatments

For the Patient: “Although some decay may require invasive drilling, in its early stages it may be addressed by less invasive means. In fact, there is a variety of minimally invasive interventions you and your dentist can use to tackle decay early.”
But fewer than 50% have sealants. Why?

A 2001 survey confirmed that one barrier to providing sealants is dentists’ concern about inadvertently sealing over caries.

28% of dental providers surveyed at a recent NNOHA Collaborative do NOT intentionally seal over decay.

What would be the consequences of sealing over decay?
The Consequences of Sealing over Decay

Sealing noncavitated caries in permanent teeth is effective in reducing caries progression.

Griffin, JDR, 2008

- 6 studies, including 4 RCTs conducted before 2007
- Sealing non-cavitated carious lesions prevented caries progression 71% compared to teeth with non-sealed lesions up to 5 years after sealant placement.
Research designed to address concerns about sealing over ACTIVE carious lesions

Sealant retention = 70% at 44 months. (If a study tooth progressed to ICDAS ≥ 5 or radiographically halfway or more through the dentin, the tooth was restored.)

Regardless of lesion severity, sealants were 100% effective at 12 mo and 98% effective over 44 mo in managing occlusal surfaces at ICDAS 0-4 (without frank cavitation).

--Fontana, JDR, 2014
Inadvertent Sealing of Tooth with Decay into Dentin

What if a DH seals a tooth that a dentist might have restored?
- Is the patient unlikely to ever see a dentist again for the next 10 years? If so, the outcome is unknown.

- For all others, there will be plenty of opportunities to arrest the caries in the rare likelihood that the sealant is not effective.
Because of limited evidence, panel was unable to make specific recommendations on the relative merits of one type of material over others.

Most studies show resin-based sealants have significantly higher retention than glass ionomer-based sealants.

Caries reduction? Similar over short term. (few studies, low quality)
Selecting Sealant Materials

• The guideline panel suggests that clinicians take into account the likelihood of experiencing lack of retention when choosing the sealant material most appropriate for a specific patient and clinical scenario.

• Predicated largely on ability to isolate and dry the tooth.

• If good isolation, resin is retained better.
  -Wright, JADA, 2016

If tooth is not full erupted or moisture control is not ideal, then Glass Ionomer is preferable.

  --Antonson, JADA, 2012..
Are We Asking the Right Question?

Validity of Sealant Retention as Surrogate for Caries Prevention – A Systematic Review

Steffen Mickensautsch*, Veerasamy Yengopal
Systematic Review Initiative for Evidence-Based Minimum Intervention in Dentistry/Department of Community Dentistry, Faculty of Health Sciences, University of the Western Cape, Bellville, South Africa

Abstract

Introduction/?: Aim To appraise the clinical literature in determining whether loss of complete sealant retention as surrogate endpoint is directly associated with caries occurrence on sealed teeth as its clinical endpoint and to apply the appraisal evidence in testing the null-hypothesis that the retention/caries ratio between different types of sealant materials (resin and glass-ionomer cement) is not statistically significant (i.e. Precrease criterion for surrogate endpoint validity). Methods: Databases: searched PubMed/Medline, Directory of Open Access Journals, IndMed, Scielo. Systematic reviews were searched for suitable trials. The search terms: “fill AND seal” and “fissure AND sealant” were used. Article selection criteria were: clinical trial reporting on the retention and caries occurrence of resin and/or glass-ionomer cement (GIC) fissure sealed permanent molar teeth; minimum 24 month follow-up periods; systematic review or meta-analysis. Datasets and information were extracted from accepted trials. The principle outcome measure was the ratio of risk of loss of complete retention to the risk of caries occurrence per sealant type (RCR). Risk of bias was assessed in trials and sensitivity analysis with regard to potential confounding factors conducted. The null-hypothesis was tested by graphical and statistical methods.

Results: The risk of loss of complete retention of sealant materials was associated with the risk of caries occurrence for resin but not for GIC based sealants. The difference between RCR values of the two sealant types was statistically significant (p<0.05). The null-hypothesis was rejected.

Conclusions: The current clinical evidence suggests that complete retention of pit and fissure sealants may not be a valid surrogate endpoint for caries prevention as its clinical endpoint. Further research is required to corroborate the current results.

Glass ionomer cement and resin-based fissure sealants are equally effective in caries prevention


Sachin Seth, DDS

Systematic review conclusion. The evidence suggests that there is no difference in the caries-preventive effects of glass ionomer cement (GIC) and resin-based fissure sealants. Therefore, both materials appear to be equally suitable for clinical application as fissure sealant materials.

Critical summary assessment. The results of a systematic review of limited evidence showed that there is no difference between the use of GIC and resin-based fissure sealants on permanent teeth in the prevention of dental caries. The conclusion that both sealant materials are equally effective does not reflect the possible confounding effects of either the resin-based fissure sealant or the GIC fissure sealant used in a split-mouth design. Evidence quality rating: Limited.


- JADA, 2011
Many Sealants are Lost within 3-5 Years: What Happens to Molars with Lost Sealants?

• Less than 13% develop dentin caries lesions within 3 years after sealant loss (re-exposure).
• Teeth sealed with Composite Resin had 4 times as many lesions (13%) as those sealed with Glass Ionomer (4%).
• Electron scanning microscopy reveals GI in deep fissures even after sealant “lost”.

Caveats:
• Low to medium caries risk children
• High viscosity sealant (Fuji IX)
• Lower than expected resin retention
How Might Sealants Work even if Lost?

• Emerging molars - highly susceptible
  • Surface enamel not fully “mature” – capable of further mineralization
  • Lack of occlusal contact enables plaque retention on occlusal surface
  • 6-7 year olds may not have strong toothbrushing habits

• Molars 3 years post-eruption – less susceptible
  • More highly mineralized enamel
  • Daily fluoride exposure (toothpaste & water/beverages) converts hydroxyapatite to fluorapatite wherever cariogenic plaque exists
  • 9-10 year olds may be more reliable & skilled toothbrushers

• Glass Ionomer
  • Micro-porosity of GI may allow enamel to mature (↑mineralization)
  • Fluoride diffuses from GI onto enamel (and dentin)
  • GI material may be retained deep in fissures
  • Any bacteria deep in the fissure are isolated from substrate needed to produce acid
Is it the Material or the Technique?

• Inferiority claims against HVGIC in comparison to resin-based sealants as current gold-standard are not supported by the clinical evidence.

• The clinical evidence suggests similar caries-preventive efficacy of HVGIC and resin-based sealants after a period of 48 months in permanent molar teeth, but remains challenged by high bias risk.

• Perhaps low-viscosity vs high-viscosity is not the issue at all, rather the use of “press finger” technique to press material into pits and fissures with a petroleum-jelly coated index finger.
Conclusion

• Both, glass ionomer and resin based sealants exhibit significant caries preventive effects.
• There is no evidence that either material is superior to the other in the prevention of dental caries.
• Therefore, both materials appear to be equally suitable for clinical application as fissure sealant materials.
• But, in the COVID-19 era the ease of use of GI and lack of aerosol generation suggests it may be superior, if not for the individual patient, then for the community - by enabling more patients to be seen at lower cost and least risk to staff.
Treatment Options for Sealants & Protective Restorations

An effective way to treat and protect caries-prone molars!
**Modified Hygiene Techniques In a COVID-19 World**

**Eliminating Aerosol Sprays**

What does this look like? Examples of modification:

- Utilizing hand instruments vs. sonic/ultrasonic instruments
- Modified plaque & stain removal vs. full-mouth coronal polishing
- **NO** (minimal) use of air-polishing
- **NO** (minimal) use of air-water syringe
- Utilizing hydrophilic sealant material placement

Adjusting to Our New Normal
So Here is What We Know... *The Facts*

*According to JADA article, 143(2): February 2012...*

1. The occlusal surface of molars is responsible for **67 to 90** percent of caries in children from 5 to 17 years of age.

2. Partially erupted molars present a particularly difficult situation.

3. As long as an erupting tooth has no antagonist contact, plaque accumulation and caries development are promoted.

4. The eruption time for the first and second molars is about **1.5 years**... *(Length of time these teeth go unprotected!)*
1. …the operculum covering the distal one-half of these teeth during the eruption process allows for the retention of plaque and the initiation of the carious process before complete eruption has occurred.

2. The location of the permanent molars in the posterior region of the child’s mouth also complicates his or her ability to properly clean these areas and remove debris.

3. “Unsealed occlusal surfaces with early enamel lesions have 4 times the chance of developing dentinal lesions according to one study.

"Evans, H.F. Partially Erupted Teeth: Seal…or Wait and Hope? Dentistry Today. Feb. 2006, p. 102-104. And here is what we see...
Fuji Triage for Partially Erupted Molars

• Almost every young **patient 6-18 years** of age will have a partially erupted molar in some stage of development.

• Indications are that **up to 50% of every partially erupted molar** exhibits signs of an incipient lesion – deep pits and fissures and hypomineralized areas are very common.

• Literature shows that patients between the **ages of 6-8 are the most susceptible** to developing decay in the first molars.

• Second and even third molars (**patients 12 - 18 years of age**) present continuing treatment options.
WHY CHOOSE A GLASS IONOMER SEALANT Instead of a RESIN SEALANT?

“...A glass ionomer sealant encourages remineralization and maturation of the underlying enamel.

Once a resin sealant is applied to the lesion, however, the protected tooth surface can no longer be remineralized.

The protective resin film inhibits the ion-exchange with saliva and biofilm fluids in both directions—not only shielding the enamel from bacterial acid challenge, but concurrently barring the potential for remineralization.”
Features/Benefits GI

- **Hydrophilic** - Works in a wet field, moisture tolerant, needs moisture to bond
- **Ease of Use** – No Etch, Not Technique Sensitive
- **Self Cure** (2 ½ min)
- Apply on **ALL molars-even partially erupted molars**
- **Exceptional fluoride release**, 6 X more F than any other sealant
- **Re-Chargeable fluoride**, promotes building of fluorapatite
- **Chemically bonds** to enamel/dentin preventing micro-leakage (even if it’s not visible, GI remains in pits/fissures for caries prevention)
- **Keeps bacteria out**, allows Ca, PO4 & F to penetrate/mature tooth
- No need to adjust occlusion GI will **wear into occlusion**
- **Low viscosity**
- **Cost & Time Effective** (4+ sealants –less than 5 minutes) **IDEAL SEALANTS!**
Vs. Resin Materials

- Moisture Sensitive
- No Chemical Adhesion
- Potential Shrinkage
- Possible Microleakage
- Marginal Discolouration
- Bacterial Penetration
What is a Glass Ionomer?

- Calcium fluoro alumino silicate glass... or
- Strontium fluoro alumino silicate glass in NEW GI’s
- Water Soluble Polyacrylic acid

Self-cured material creating an Acid-Base Reaction (chemical reaction) & Releases Fluoride for relatively long periods
Glass Ionomer & Dentin
A Glass Ionomer Surface Protectant

Cumulative Fluoride Release

Source: GC R&D.

Exceptionally High Rechargeable Fluoride Release
What About Retention?

After 3 years Post-Op

Cross Section of Extracted Tooth
Fuji Triage Technique In a COVID-19 World

- Identify teeth to be sealed partially/fully erupted.
- Clean plaque from occlusal surfaces with a wet cotton roll.
- Tap capsule on hard surface, Tap, Activate, Mix.
- Set into mixer, Mix 10 sec., high speed (approximately 4,000 RPM), 8 sec. for longer working time.
- Extruded GI onto tooth with applier. Press into occlusal surface with wet finger.
- Let set 1-2 min. Patient is ready to go.
- Apply GC Cavity Conditioner, 10 sec. with microtip brush. Use very wet cotton roll (pressing down into grooves) to remove the cavity conditioner.
- Place capsule into capsule applier. Prime (click 2x).

Photos courtesy of Rochelle G. Lindemeyer, DMD
Mistakes Clinicians Make

1. Over dry the teeth
2. Acid Etch the teeth

Removal of the Smear Layer is important for ensuring strong adhesion. **DO NOT** Acid Etch - **It WILL** pull moisture out of the tooth.
Cavity Conditioner vs. Acid Etching

Poly Acrylic Acid

Phosphoric Acid Etched Dentin
• Exceptional fluoride release

• Creates a strong, acid-resistant layer, keeping bacteria at bay

• Calcium, phosphate & fluoride ions to strengthen teeth

• Moisture tolerant bonding, requires no etching

"Regarding recent inquiries about dental sealants, we confirm GC America’s dental glass ionomer sealants sold in the USA, Canada & Latin America do not contain Bis-GMA or Bis-Phenol A (BPA) as an ingredient."
Indications for Use:

1. Sealant/Protective Restoration
2. Class V at Gingival Margin
3. Incipient Lesions (areas you would typically “watch”)

An Ounce of Prevention is Worth a Pound of Cure
- Benjamin Franklin -
**Paradigm Shift**

The Days of _Only_ Doing Sealants on Fully Erupted, Non-Cavitated, Pedo Patients is No Longer the Standard of Care

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*Insanity: doing the same thing over and over again and expecting different results.*

*Albert Einstein*
Additional Resources:

Sealants Microsite
http://www.getsealants.com/resources.php

QUESTIONS?
Future Events

• Webinar: Rubber Dam Refresher for COVID-19
  • July 27, 2020 at 11am Mountain Time
  • https://attendee.gotowebinar.com/register/6395590166326567952

• Health Center School-Based Dental Programs and COVID-19: A Listening Session
  • August 10, 2020 at 11:30 am Mountain Time
  • https://attendee.gotowebinar.com/register/2291661915941139724
Contact Us!

Candace Owen, RDH, MS, MPH
NNOHA Education Director
candace@nnoha.org

Irene V. Hilton, DDS, MPH, FACD
NNOHA Dental Consultant
irene@nnoha.org

National Network for Oral Health Access
181 E 56th Avenue, Suite 401
Denver, CO 80216
Phone: (303) 957-0635
Fax: (866) 316-4995
info@nnoha.org
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