Multiple Uses of Silver Diamine Fluoride
Changing the Practice Paradigm

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Disclosures:

I am currently a member of the ADA National Elder Care Committee.

I have no financial relationship with any of the products discussed.

Some of the products discussed in this presentation are used at the University of Maryland School of Dentistry and this presentation is not intended as an endorsement.
Goal: Introduce Silver Diamine Fluoride (SDF)

- **What** is it?
- How does it **work**?
- How **effective** is it? What is the evidence.
- What are the **indications** to use it?
- Why use it? What are the **benefits**?
- What are the **risks**, or when NOT to use it
- What happens after it is used?
Caries Management - Treatment Options

- Remineralize
- Recontour
- Amalgam
- Glass Ionomer
- Resin-reinforced glass ionomer
- Composite
- Full coverage
- Extract
- Silver Diamine Fluoride
What is SDF?

A non-invasive solution that arrests AND prevents carious lesions, more cost-effectively than other fluorides.

**Historically**, 1960’s in Japan, studies on using silver and fluoride to increase resistance of enamel to caries. (Yamaga, R. 1972)

**In 2015**, Advantage Arrest (Elevate Oral Care) 38% SDF available in US FDA cleared for dentinal hypersensitivity agent (like fluoride varnish)

Based on extensive research, is used for caries management (off label use) for children and adults (like fluoride varnish).

**An underutilized, evidence-based preventive agent for dental caries.**
Silver Diamine Fluoride arrests and prevent caries.
Examples of caries in older adults
Silver Diamine Fluorides

<table>
<thead>
<tr>
<th>ADVANTAGE ARREST</th>
<th>RIVA STAR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH</strong></td>
<td>10</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>Room temperature</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Blue</td>
</tr>
<tr>
<td><strong>Purchase</strong></td>
<td>Elevate Oral Care only</td>
</tr>
<tr>
<td><strong>Dose</strong></td>
<td>Unit dose and 8 ml bottle (250 doses)</td>
</tr>
<tr>
<td><strong>Stain</strong></td>
<td>Stains caries (NOT tooth)</td>
</tr>
<tr>
<td><strong>Restoration</strong></td>
<td>May NOT require restoration</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>13</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>Refrigeration</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Clear</td>
</tr>
<tr>
<td><strong>Purchase</strong></td>
<td>Dental distributors</td>
</tr>
<tr>
<td><strong>Dose</strong></td>
<td>Unit dose only – 10/kit</td>
</tr>
<tr>
<td><strong>Stain</strong></td>
<td>Less staining</td>
</tr>
<tr>
<td><strong>Restoration</strong></td>
<td>Requires restoration, removal of sound tooth</td>
</tr>
</tbody>
</table>
What does SDF do?

1. Decreases dentin hypersensitivity
2. Arrests carious lesions
3. Prevents carious lesions
4. Kills pathogenic organisms
5. Remineralizes softened dentin
**SDF** – how does it work?

**Bactericidal**
- Denatures proteins, breaks cell walls
- Prevents bacterial growth
- Deactivates enzymes

**Remineralizes to fluoroapatite**
- Increases lesion hardness and density
- Prevents demineralization

Penetrates enamel (~25 microns) and dentin (~200-300 microns)
Occludes dental tubules resulting in SDF arrested lesions (~150 microns thick)
12 randomly controlled trials (RCT) with 1815 patients treated with SDF = safe

9+ studies on caries arrest
- \( \sim 90\% \) arrest with 2 / year application
- 40 – 80 % arrest with 1/ year application

6+ studies on caries prevention (3 overlap)
- 70-80% prevention in children by application ONLY to lesions
- 25- 70% prevention, outperforms all other fluoride strategies.

11+ studies on root caries prevention –
- 71% reduction in 3 years; 25% in 2 years
SDF Application: Medical management of caries

1. Isolate with cotton
2. Remove superficial debris (toothbrush clean)
   - Place Vaseline or cocoa butter on gingiva if concerned about blanching
   - Consider flavored lip balm – if concerned about taste.
3. Air dry
4. Apply with a micro-brush
5. Keep on tooth for 60 seconds
6. Air dry
7. If excess, wipe from tooth

OPTIONAL: cover with fluoride varnish
SDF Application: **KEYS:**

1. Liquid does not ‘fall’ off of brush
2. Interproximal lesions – superfloss, wedges, wicking

3. **Lesions remineralize - harden**
   - Can be the final treatment.
   - Arrests ~60% with one tx; Changing environment needed

4. When lesion arrested, no treatment is necessary
5. IF restore, no anesthesia needed as dentinal tubules are blocked
6. Enhances bond strength of GIC
7. No issues with toxicity
8. Can be used as liner of restoration.
When to use **SDF**? manage all caries

- **HIGH caries risk** – including but not limited to:
  - Extensive coronal OR root carious lesions
  - Early caries & in those with limited access to care
  - Those with poor oral hygiene
  - Recurrent decay around restorations
  - More lesions than treatable at 1 visit
  - Behavior or medical management challenges
When to use SDF? (cont)

Patients wait listed for sedation or OR care
Ventilator assisted pneumonia (VAP)
Difficult to treat lesions - crown margins, limited opening

Locations:
Private practice
Long term care facilities
Community based clinics, mobile programs
Dental schools
Mission of mercy programs, mission programs
Utilizing SDF successfully
One extreme case
When using SDF ...

- Will **not** stain sound enamel or dentin
- Turns caries black - discolors demineralized
- Discolors soft tissue, and other objects
  - May take a few hours to appear
  - Will fade from soft tissue fades in a few days
- Like acid etch, be cautious
- One application works – two is best
- Applying it takes about 5 minutes

- No discomfort
- May or may **NOT** need a restoration
- IF you choose to restore, do **NOT** remove the black.
- Likely to need NO anesthesia

**When NOT to use:**
- Allergy to silver
- Periapical lesions
SMART Technique

SDF + GIC – Silver modified ART (atraumatic restorative treatment)

Glass Ionomer cements (GIC)
- Seals the SDF in place
- Has sustained fluoride release
- May use composite sandwich technique for esthetics

PROTOCOL:
- SDF + Standard GIC
- May darken over time.
- Can be done same day or later
- Assess cavitation, hygiene, ability to provide care
<table>
<thead>
<tr>
<th><strong>GIC</strong></th>
<th><strong>SDF</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal stops progression</td>
<td>Prevents lesions throughout</td>
</tr>
<tr>
<td>Seals in SDF</td>
<td>Prevents new lesions</td>
</tr>
<tr>
<td>Prevents lesions nearby</td>
<td>More applications increase arrest</td>
</tr>
<tr>
<td>May need fluoride reapplication</td>
<td>Overall less costly – possibly best option</td>
</tr>
<tr>
<td>Small lesions may not hold GIC</td>
<td>Less technique sensitive</td>
</tr>
</tbody>
</table>
SDF also provides Primary Prevention
Horst and Heimo, 2019

Annual use prevents new caries in primary teeth and permanent molars.

Higher levels of prevention with less frequent applications of SDF than fluoride varnish.

Recommend: Annual SDF application on high-risk surfaces in high caries-risk patients, any age.

SDF can be placed on any tooth surface, and the fluoride released may protect proximal surfaces not directly treated.

SDF prevents 61% of caries lesions. [all studies, weighted average]
CDT Codes

• **D1208** – Fluoride application (primary prevention) – gel /foams
  • Very different than SDF -

• **D9910** – Application of a desensitizing medicament

• **D1354** - Interim application of caries arresting medicament

• New Code being addressed by CDT code committee
Informed Consent Form

San Francisco Department of Public Health
Dental Services!

INFORMED CONSENT FOR SILVER DIAMINE FLUORIDE

Facts for consideration:
- Silver Diamine Fluoride (SDF) is a liquid that helps stop tooth decay. SDF is applied every 6-12 months.
- A small amount of SDF is applied to the decayed tooth area.
- After SDF application, no eating or drinking for 60 minutes and no tooth brushing until the following morning.
- The decayed area will stain black permanently. Healthy tooth structure will not stain.
- It should not be treated with SDF if:
  1. You are allergic to silver.
  2. There are painful, sore or raw areas on your gums or anywhere in your mouth.

Benefits of receiving SDF:
- Helps stop tooth decay.
- Fast!
- Does not hurt.

Risks of receiving SDF:
- The affected area will stain black permanently. This means SDF is working.
- Teeth colored fillings and crowns may discolor if SDF is applied to them.
- After SDF treatment, a filling or crown might still be needed.
- If accidentally applied to the skin or gums, a brown or white stain may appear that causes no harm, cannot be washed off and will disappear in one to three weeks.
- Permanent dark spots if spilled on clothing.
- Allergic reaction possible.
- Risks that the procedure will not stop the decay.
- Not every cavity can be treated with SDF.

Alternatives to SDF, not limited to the following:
- No treatment, which may lead to continued breakdown of the tooth. Symptoms may get worse.
- Placement of fillings or crowns, extractions or referral to a specialist.

I have read this form. I understand the treatment and have had the chance to ask questions. I have seen the photo of how teeth may look after SDF discolors the cavities. I understand that I may refuse treatment with SDF. I understand that I can decide to have no treatment or I can have fillings, crowns, or extractions done at this or another dental office.

I consent and authorize SDFPH Dental Services to use Silver Diamine Fluoride to help stop tooth decay.

Signature of patient/parent/guardian: __________________________ Date: ____________________

Signature of witness: __________________________ Date: ____________________
ADA – Evidence Based Clinical Practice Guidelines on Nonrestorative Treatments for Carious Lesions - 2018
ADA.org/caries

Provides “how to” begin these practices in your office, including chair-side guides and information for patients.

For more information: ADA Center for Evidence-Based Dentistry – ebd@ada.org

Contact/subscribe to Elevate Oral Care “The Silver Bulletin” – Elevateoralcare.com
More resources:

2. Perez-Hernandez et al, European Archives of Pediatric Dentistry. Doi.org/10/1007s40368-01800374-4
5. ADHA. Dental Hygiene Practice Act Overview. 2016. www.ADHA.org
GIC vs. SDF

Lesion

- GIC
  - Seal stops progression
  - Seal may seal in SDF
  - GIC prevents lesions nearby
  - Needs less frequent reapplication

- SDF
  - Prevents lesions throughout
  - SDF needs more applications
  - Less costly
  - Less technique sensitive
  - Deep lesions may progress