

## SDF LECTURE HANDOUT:

**“SDF and SMART”  
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### **Bacterial diseases of the human body, including dental caries, cannot be treated effectively via surgical means only:**

-Surgical management is contraindicated when the treatment goal - before any other goal - is the establishment of a measurable reduction in the disease.

### **Decayed dentin is the tooth:**

-It's not exogenous and when it is partially excavated or left unexcavated it can be re-mineralized and strengthened with SDF + GIC.

### **MMC methods**

- 1) Apply SDF 3X, e.g. once a month for 3 months.
- 2) Apply SDF twice a year.
- 3) Apply SDF in one appointment then seal with GIC (SMART – Silver Modified ART)

Your choice of 1, 2 or 3 depends on:

- clinical setting,
- availability of air/water/suction,
- patient recall-reliability,
- operator comfort level, and
- operator training or lack of training.

**Inside a lesion, Ag<sup>+</sup> ions form a squamous layer of Ag protein conjugates that increase resistance to acid dissolution** thus limiting lesion growth and increasing lesion mineral density and hardness.

### **Inside bacterial cell walls , Ag<sup>+</sup> ions:**

-Disturb cellular respiration  
-Attach to bacterial DNA where they stop cell replication in a bacterial-killing domino effect, thus greatly outperforming other anti-caries agents.

**SDF is an antibiotic liquid** because Ag<sup>+</sup> is antibacterial/ bactericidal/antimicrobial due to its detrimental effect on microbial cellular respiration and DNA replication.

**There are twelve published randomized clinical trials evaluating SDF for caries arrest and/or prevention** of at least one year in duration. These studies each involved hundreds of children aged 3 to 9 and adults aged 60 to 89.

**SDF greatly outperformed FV for caries arrest in each and every RCT and peer review study.**

-Annual application of SDF prevented many more carious lesions than four-times-per year applications of FV in children and the elderly. (*Chu CH, Lo ECM, Lin HC. Effectiveness of silver diamine fluoride and sodium fluoride varnish in arresting dentin caries in Chinese preschool children. J Dent Res 2002;81(11):767-770.*)

-1X/year SDF arrested 3x more lesions than 4X/year FI varnish, compared to control (2002 by *Chu at Hong Kong Univ .*)

**There are no adverse reports with SDF use in:**

- more than 45 years in Japan, and
- more than 35 years in Australia, Brazil, Argentina, Cuba and China, and
- there has never been one single reported incidence of an adverse reaction or harmful consequence of anyone using SDF in over 80+ years of its use internationally.

**Safety:**

- The highest applied dose of SDF for three teeth measured 2.37 mg of silver, which would allow for 400 applications before seeing even the slightest evidence of argyria.
- One drop of SDF (enough to treat 6 teeth) contains approximately 1/5 the fluoride level of the smallest unit dose used for a normal FV application.
- One drop of SDF contains the same amount of fluoride as 1 liter of 1 ppm F tap water.

**SDF + GIC can be combined to get even better results than with either alone.**

- OPTION #1:** Do nothing more than apply SDF 3X to arrest caries.
- OPTION #2:** Apply GIC after 3<sup>rd</sup> SDF application to fill cavitation and restore function
- OPTION #3:** Apply SDF 1X and seal it in with GIC all in one appointment = **SMART = Silver Modified ART**

**SDF and SMART protocols:**

-**SDF:** dry & apply, cover with varnish or Vaseline to prevent dilution by saliva. Do anything you can to get as much of this medicine into the lesion as possible.

-**SMART** = clean margins, condition with PAA, rinse, SDF, high viscosity GIC (pure if possible, else high GIC/resin like Fuji 2LC).

**SDF is particularly useful for patients with:**

- Extreme caries risk
- Behavioral or medical management challenges
- More lesions than treatable at 1 visit
- Difficult to treat lesions
- No access or limited access to care.

### **Exactly what does SDF do?**

- Stops tooth decay.
- Relieves sensitivity.
- Outperforms other anti-caries medicaments in killing bacteria.
- Prevents further problems while the patient is waiting for definitive care.
- Provides a low cost treatment for patients who can't afford traditional procedures.
- Offers treatment for patients who can't tolerate injections or the dental drill.

### **SDF benefits any patient waiting for an OR visit or sedation in a dental office:**

- Long waits for hospital O.R. appointments are common so many patients do not receive any treatment before teeth become so infected they can no longer be saved.
- Medicaid, commercial insurance companies, and taxpayers will save a lot of money when an SDF treatment makes any O.R. visit unnecessary.
- SDF reduces the need for conscious sedation or general anesthesia.

### **SDF greatly benefits dental phobics:**

- No needles, no drills
- With SDF, fear is immediately reduced.
- Fearful patients will eventually become more willing to accept traditional dental treatment that requires needles or drills.
- Fearful patients treated with SDF will recommend SDF to other fearful patients who have avoided making an appointment with a dental office in the past.

### **Special needs patients:**

- Can receive SDF treatment outside the dental office or anywhere, even in a wheelchair.
- Suffer from dental neglect while they wait for a hospital appointment.
- Will benefit from immediate treatment with SDF to arrest their caries.

### **Patient affordability:**

- SDF alone, or with glass ionomer cement as a restorative material, is an inexpensive alternative that arrests the decay process until a patient can afford traditional tooth restoration.

### **Evidence for the benefit of partial or incomplete caries removal:**

- "There is substantial evidence that removing all vestiges of infected dentin from lesions approaching the pulp is not required for caries management." (*JADA 2008*)
- "The removal of infected dentin isn't fundamental for caries arrest." (*Pediatr. Den 2013.*)
- "There is a clinical advantage to leaving caries partially un-excavated", (*Cochrane Review, 2013*)

### **Only 50% of all children with paid-for benefits via Medicaid and private insurance utilize the benefits they already have (2013)**

Reasons cited for such poor utilization:

- Too expensive
- Too invasive
- Parents had bad experiences related to their own dental care.

**Watching after applying SDF is TOTALLY different than watching without SDF.**

**Outcomes are all that matter in the long run:**

- It does not matter whether a material “looks” like it’s stuck in a tooth.
- For instance, if a resin sealant “lifts” (like in a distal pit), substrate gets under it and you get decay.
- But that almost never happens with GIC because even if a GIC sealant “lifts”, the high fluoride release prevents substrate from causing decay.

**If used in the Medicaid-enrolled population, SDF can potentially save state Medicaid programs between \$15 and \$330 per caries-related visit = saving state Medicaid programs \$ millions.**

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**Justification for SMART:**

- Within the porosity of enamel and dentin, acid transport and the migration of mineral ions OUT of the tooth lead to the caries process.
- BUT, the opposite can also occur: calcifying ions from SDF+GIC can go in along the same pathways, to re-mineralize a tooth.
- AND, odontoblasts in the pulp are stimulated by SDF +GIC to protect the tooth by laying down secondary dentin.
- AND the underlying SDF also re-mineralizes quite vigorously as it simultaneously kills bacteria.
- AND the overlying GIC re-mineralizes porous, water-based, ion-transporting tooth structures even when deeply de-mineralized.
- Thus, combining SDF and GIC makes logical sense.

**The cycle of de-mineralization followed by re-mineralization is constant in the normal oral environment.**

- When the speed and level of de-mineralization becomes predominant surface cavitation occurs.
- BUT, 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.

**There are no reported deaths from UNTREATED dental caries in baby teeth. But there are many reported deaths from the TREATMENT of caries in baby teeth under G.A. and sedation** (3 in California last year alone).

-Untreated caries in permanent teeth can eventually cause death (the most recent number being 110 people per year who die in ERs due to permanent tooth oral infections -kids like Demonte Driver who died of a permanent tooth infection, not a baby tooth infection).

-Kids end up in ERs with swollen faces that look scary and painful, from untreated baby tooth cavities,

-But **zero individuals have ever died from cavities or infections in baby teeth!**

- Baby tooth abscesses drain out the gums into the mouth, because baby tooth roots are thin and short and baby tooth abscesses start in the furcations between the roots where the bone is thinner.

-**Why put kids at risk of dying under G.A. or in-office sedation to have baby teeth extracted?**

**December 2016 the US Food and Drug Administration issued this warning:**

“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 their brains.”