Silver diamine fluoride: The newest tool in your caries management toolkit

Abstract
Silver diamine fluoride (SDF) has been used worldwide since 1970 to arrest decay. In the United States, the product received FDA clearance in 2014 as a desensitizing agent (similar to fluoride varnish) and in October 2016 it was recognized by the Food and Drug Administration with breakthrough therapy designation for caries treatment. This course will look at the latest tool in the caries management toolkit to help the reader incorporate this new technology into clinical practice. Keeping in mind that SDF is relatively new to the US, and research/protocols are still evolving, clinical findings and guidelines for SDF currently being used for patients of all ages will be discussed.

Educational Objectives
At the conclusion of this educational activity participants will be able to:
1. Understand the mechanism of action of Silver Diamine Fluoride
2. Discuss indications/contraindications for use
3. Identify challenges associated with Silver Diamine Fluoride
4. List steps for Non-Restorative and SMART placement

Authors' Profiles
Judy Bendit, RDH, BS, has more than 45 years of experience in dentistry. She is a speaker, author, faculty member at the Temple University School of Dentistry, an alumni board member of the University of Pennsylvania Dental School, and an advisory board member for Palm Beach State College's dental hygiene program. She is also a longstanding member of the American Dental Hygienists’ Association and a distinguished academy member of the Pennsylvania Dental Hygienists’ Association, and she is a volunteer clinician both at home and abroad.

Douglas A. Young DDS, EdD, MBA, MS, is a professor at the University of the Pacific where he is an active and ardent educator in the field of minimally invasive dentistry and cariology. He was one of the founders of the CAMBRA (caries management by risk assessment) Coalition, ADEA Cariology Section, and the American Academy of Cariology (AAC). Dr. Young served on the ADA Council of Scientific Affairs (2012-2016) and is currently a cariology consultant for the ADA. Dr. Young has presented at congresses and universities around the world. He has been published in numerous peer-reviewed dental journals and textbooks focusing on minimally invasive dentistry, glass ionomer, and cariology.

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The cost of this CE course is $59.00 for 3 CE credits.
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Background
Dental caries is a complex, multifactorial disease which remains a significant problem across all age groups. Caries management by risk assessment (CAMBRA) is an evidence-based strategy to prevent and treat the underlying disease causing caries lesions. CAMBRA uses caries risk assessment (CRA) to identify pathologic risk factors that are unique to the patient in order to develop treatment options to reduce the progression of caries disease. These options include chemical therapeutics coupled with behavioral modification targeted at altering biofilm behavior, halting further demineralization, and supporting remineralization. Recently, SDF has demonstrated great promise in the United States when used as a chemotherapeutic option for caries management and when used alone or in combination with glass ionomer cement restorations.

The ADA Caries Classification System (ADA CCS) was published to provide US oral health-care professionals the terminology needed to discern when caries lesions should be treated chemically and when surgical restoration would be indicated. The ADA CCS addresses all stages of caries lesions (non-cavitated and cavitated) based on the site, extent, and when possible, activity.

What is SDF?
Silver diamine fluoride is chemically 38% weight/volume Ag(NH3)2F. The silver acts as an antimicrobial with substantivity, preventing reinvasion of cariogenic bacteria after application. The fluoride provides remineralization, and the silver diamine is a metal complex that dramatically stabilizes the high concentrations of silver and fluoride in solution. SDF has the highest fluoride concentration (44,800 ppm fluoride ion) of any available material and is about twice that of fluoride varnish. Upon application of SDF to a demineralized or infected surface, a silver-protein conjugate layer forms, increasing resistance to acid dissolution and enzymatic digestion. Treated lesions remineralize, increasing mineral density and hardness while decreasing the demineralization layer. A 2016 systematic review with meta-analysis by Gao and colleagues demonstrated the efficacy of SDF at arresting dentinal caries.

Why use SDF?
The possibility of avoiding more invasive treatments involving dental injections, dental drills, and even general anesthesia are just a few of the significant advantages of using SDF to chemically arrest an active caries lesion. SDF has been shown to be especially advantageous in populations such as young children; the elderly; those with multiple caries; those with caries lesions with problematic access where treatment by conventional means is not possible; special needs patients; and phobic patients. SDF can transform a child’s first dental experience from traumatic to pleasant, instilling trust and making subsequent interactions with dental professionals more successful. Most significantly, SDF may save lives. Many patients are being scheduled for IV sedation or general anesthesia simply because they are not manageable in the normal clinical setting. Sedation and general anesthesia techniques are not without risk and deaths have been reported. Even when there is a medical reason for general anesthesia in a hospital setting, there is often a one- to two-year waiting period for nonurgent care for some populations. SDF is invaluable in these situations by arresting disease progression without sedation or general anesthesia. If necessary, for medical reasons, more comprehensive treatment in a hospital setting can be scheduled once the lesions are arrested.

Usually, to effectively arrest and remineralize caries lesions, a comprehensive dental examination, caries risk assessment, access to dental equipment, products, and interventions to modify the oral chemistry and behavior of the patient are required. A trained clinician and a high level of patient motivation and cooperation to implement these curative strategies are needed. When patient cooperation is less than ideal, SDF can now offer an alternative.

SDF is minimally invasive and preserves tooth structure. Therefore, once the caries lesion is arrested and disease process has been halted, one could argue that an arrested caries lesion (non-cavitated or cavitated) may not require a dental restoration to maintain health unless the patient wants to improve form, function, or esthetics.
Table 1 Comparison of common fluoride products

<table>
<thead>
<tr>
<th>Fluoride concentration</th>
<th>Parts per million (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver diamine fluoride</td>
<td>44,800 ppm</td>
</tr>
<tr>
<td>5% fluoride varnish</td>
<td>22,600 ppm</td>
</tr>
<tr>
<td>APF (in office)</td>
<td>12,300 ppm</td>
</tr>
<tr>
<td>NaF₂ (Rx)</td>
<td>9,000 ppm</td>
</tr>
<tr>
<td>Rinse (Rx)</td>
<td>3,300 ppm</td>
</tr>
<tr>
<td>SnF₂ w/ACP</td>
<td>970 ppm</td>
</tr>
<tr>
<td>CPP ACP with fluoride</td>
<td>900 ppm</td>
</tr>
<tr>
<td>OTC .05% NaF₂ rinse</td>
<td>200 ppm</td>
</tr>
</tbody>
</table>

Safety and toxicity
The safety profile of SDF is remarkable. The maximum dose was determined to be one drop (25 uL) of SDF per 10kg (~ 22 lbs.) per treatment visit, based on LD₅₀ rat studies required for FDA clearance using a 400-fold safety margin. LD stands for “Lethal Dose.” LD₅₀ is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. The LD₅₀ is one way to measure the acute toxicity of a material.

Topical application of SDF to teeth with caries lesions is very safe. One drop of SDF is roughly equivalent to drinking a liter of fluoridated water or using fluoridated toothpaste. Also, a good proportion of the material on the brush remains on the brush and is never bioavailable, further reducing the dose and potential for toxicity.

Classification, coding, and cost
In 2014, SDF was cleared by the US Food and Drug Administration for marketing as a Class II medical device to treat tooth sensitivity. Like fluoride varnish, SDF is used off label to treat caries lesions.

SDF became commercially available in the US in 2015 and is marketed as Advantage Arrest by Elevate Oral Care LLC (West Palm Beach, Fla.). In January of 2016, the Current Dental Terminology (CDT) billing code 1354 became active. It is interesting to note that this process took only one year as compared to fluoride varnish that took 16 years. CDT 1354 can be used for “Conservative treatment of an active, asymptomatic caries lesion by topical application of a caries-arresting or inhibiting medicament without mechanical removal of sound tooth structure.” With the introduction of CDT 1354, some third-party payers have started to reimburse for the application of SDF, but reimbursement has yet to become widespread. SDF is cost effective at $.60 per drop (one drop treats approximately five surfaces). In fact, some state Medicaid programs are currently reimbursing for CDT 1354.

In October 2016, SDF attracted further attention by being awarded breakthrough therapy designation by the FDA because it demonstrated “substantial improvement over existing therapies.”

Table 2: CDT codes used for fluoride

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1354</td>
<td>Interim caries arresting medicament application</td>
</tr>
<tr>
<td>D1208</td>
<td>Topical application of fluoride</td>
</tr>
<tr>
<td>D9910</td>
<td>Application of a desensitizing medicament, per visit</td>
</tr>
<tr>
<td>D1999</td>
<td>Unspecified preventive procedure by report</td>
</tr>
</tbody>
</table>

Note: In March 2017, the ADA Code Revision Committee approved the change from “per application” to “per tooth” beginning January 1, 2018.

Who can place SDF?
A licensed dentist in any state can apply SDF. We advise all other clinicians to examine their states’ dental board practice acts to determine if they can place SDF. For hygienists, this web site may be helpful: http://www.adha.org. Many state regulatory agencies consider SDF under existing guidance for the use of topical fluorides.

Indications
1. SDF is used for the treatment of high or extreme caries risk patients, especially those with xerostomia or severe early childhood caries (SECC). (see Figure 1)

   Figure 1: Pre-and post-operative SDF on a xerostomic patient (no restoration).

   (Photos courtesy of Dr. Angela Lee)

Arresting a lesion before conservative caries removal and final restoration, if needed, will preserve tooth structure and reduce mechanical pulp exposures. It is also indicated for patients with multiple caries lesions that may not all be treated in one visit, or will likely get worse before treatment can be completed (e.g., long waiting time for hospital dentistry under general anesthesia).

2. SDF is warranted when traditional treatment is challenged by behavioral or medical management.

3. SDF may access areas impossible to reach with traditional approaches, including partially erupted third molars, furcations, and under and around existing restorations. (see Figure 2)

   Figure 2: SDF Application in difficult to reach locations.

   (Photo courtesy Monica Savalli RDH, DDS)
4. SDF can be used for patients with limited access to dental care or limited financial resources for traditional care, e.g., patients in developing countries, nursing homes, rural areas, etc.
5. SDF is an excellent desensitizer and often reduces or eliminates the need for local anesthesia.
6. Regardless of financial status, SDF should be considered as an option when the patient requests more conservative care.

**Contraindications and precautions**
SDF is contraindicated if there is a history of silver allergy and should be used with caution with ulcerations or stomatitis. While SDF is safe, clinicians should exercise caution with a tooth that is symptomatic, partially necrotic, or otherwise pulparly involved. With careful application, SDF should not go beyond treated caries sites, but patients and providers should be aware that SDF may cause stinging if it contacts soft tissue, ulcerations, or lacerations. SDF will soon be available in a blue tint, making it much easier to visualize upon placement.

Patients who are concerned about fluoride must be made aware that SDF contains fluoride. The patient can be educated that there is ten times less fluoride in one drop of SDF than 0.5 ml unit-doses of fluoride varnish because so little is actually used. Patients are reminded that SDF is not ingested but merely placed topically on the caries lesion.

**Clinical observation**
It should be noted that multiple applications (minimum of two applications annually) of SDF are required for predictable caries arrest. In 2016, a suggested SDF protocol was published by Horst. There are some updates on this protocol based on studies and clinical observation since those protocols were originally proposed. Many clinicians are reporting they no longer see the need for rinsing off the SDF after placement, given its margin of safety and lack of clinical complaints from patients. It is also reported that it is no longer mandatory to protect the gingiva with petroleum jelly since adverse reactions are few and very minor regarding SDF contacting the gingiva. In contrast, there is a greater risk that the petroleum jelly can get on the caries lesion and affect SDF uptake and glass ionomer cement (GIC) bonding. Originally, clinicians were concerned that SDF would affect bond strength or restoration retention. This has not been reported with conventional GIC restorations, nor does it seem to compromise the integrity of crown adhesion. At least one study noted in No. 3.

Light curing SDF is not necessary or recommended and will cause darkening of resin-based restorations.

**Side effects and precautions**
Placement of SDF should be restricted to the caries lesion being treated. Predictable side effects include darkening of the treated lesion (it will not usually stain healthy tooth structure) and a short-lived, bitter metallic taste. A dab of toothpaste on the tongue may help with the taste. If SDF contacts soft tissue, a temporary stinging and/or staining may occur (usually brown in color on the skin and white or gray in appearance on the oral tissues). Any staining or soft tissue irritation will be temporary, typically disappearing in several days. Caution should also be taken with clinical surfaces and uniforms as staining can occur and will not come off. There are several existing informed consent forms available on the internet. A consent form should be read and signed by the patient prior to placing SDF.

**Step-by-step SDF placement (no restoration)**
The following example is based on clinical experience and it is important for the reader to understand that at this time, there is no scientific evidence to support one method of placing SDF over another. The research base for SDF use is evolving rapidly. What we know today may be disproved or modified tomorrow. The information presented is accurate to the best of our knowledge as of June 2017.
1. Wear standard personal protective equipment (PPE), and make sure the patient is wearing safety glasses and a plastic-lined bib.
2. Dispense SDF into a plastic dappen dish. One drop treats five surfaces.
3. If you wish, you may apply extraoral protection for the lips and surrounding area using petroleum jelly or lip balm. Some patients, with a keen sense of smell, find a scented lip balm will mask the odor of SDF as it is placed in the mouth. It is critical to make sure that no petroleum jelly or lip balm gets on the caries lesion or it will inhibit uptake of the SDF and affect bonding of any dental restorative materials placed that day.
4. Use of a saliva ejector and/or suction bite-block device can be helpful.
5. If a suction bite-block device is not used, try to isolate the tongue and cheek from the affected teeth using gauze, cotton rolls, or absorbent triangles.
6. Petroleum jelly is not normally needed to protect the intraoral soft tissues given the safety of SDF and the risk of detrimental effects of getting it on the lesion. Some feel it is helpful when there are already irritations on surrounding soft tissues such as ulcerations or mucositis. See critical note in No. 3.
7. Desiccate the carious surface with air or a cotton swab if air is not available.
8. Immerse a stiff microbrush into the SDF in the dappen dish and saturate the lesion with SDF using a scrubbing motion. This is best done with a dental assistant to avoid SDF contact with other unintended structures.
9. While scrubbing, allow the SDF to absorb for at least one minute, if possible. For uncooperative patients, one minute may not be achievable; for cooperative patients, longer exposure time may be advantageous.
10. SDF can be applied to interproximal caries lesions with the use of spongy floss. The spongy floss is inserted so the “fuzzy” part of the floss is adjacent to the contact. A small section next to the contact is then saturated with SDF and pulled under the contact area. Let sit for at least one minute when possible. (see Figure 3)

Figure 3: Placing SDF on an approximal caries lesion using Super floss TM. (Photo courtesy of Dr. Jason Hirsch)

11. When done applying the SDF, many feel it is helpful to cover the area immediately with fluoride varnish or petroleum jelly to keep the SDF in contact with the caries lesion as long as possible and to mask any taste from the SDF. If a restoration is going to be placed on the same day as SDF application, do NOT do this step.

12. Cleanup: Invert all used cotton, microbrush, and dappen dish into a glove so SDF can’t drip on any surface or skin. Dispose of materials in a trash can.

Silver-modified atraumatic restorative treatment (SMART)
As stated previously, at least two applications of SDF will dramatically improve the arrest rate. However, there are instances when it is not practical to leave a gross cavitation open while implementing SDF arrest procedures. In addition, it may not be possible for the patient to return for dental care for multiple SDF treatments and subsequent restoration. In either case, for purposes of this manuscript, we will define SMART as “Silver Modified Atraumatic Restorative Treatment,” because SDF is applied and immediately restored with sealed margins and conventional GIC (self-curing) at the same appointment. A conventional GIC restoration may be the ideal restorative material for SMART because it is hydrophilic and must be placed directly on a moist surface. It does not require light curing, which will turn the restoration dark. SMART attempts to combine three proven clinical procedures with high levels of evidence, without violating any of the individual principles of each: 1) caries arrest with SDF; 2) partial or incomplete caries removal; and 3) placement of a conventional GIC restoration. In the case of a deep cavitated lesion on a vital and asymptomatic tooth, systematic reviews demonstrate that partial/incomplete caries removal by cleaning the perimeter of the lesion (where mechanical pulp exposure is unlikely) while not excavating the deeper areas of the lesion, and cutting off the nutrient source for any remaining bacteria by placement of a sealed restoration, has better outcomes than total caries removal. Partial caries removal now has international consensus as a best practice. SDF is bactericidal to remaining bacteria in the dentin, and arrests caries and remineralizes the surface. Conventional GIC will chemically bond to the moist surface, and enhance remineralization and acid resistance at the tooth-restorative interphase. Because the perimeter of the lesion was mechanically cleaned, it ensures a chemically sealed restoration that will arrest and remineralize the caries lesion, preserving tooth structure and enhancing pulp vitality. Please note that mechanically cleaning the perimeter of the lesion may not be possible in all instances (uncooperative patients) and some flexibility of the SMART procedure is expected.

Step-by-step SMART
1. Remove biofilm and pellicle with pumice or defocused air abrasion in the surrounding area of the lesion to be treated. (GIC has no chemical bond to biofilm or pellicle.)
2. Apply SDF as per steps 1-9 in the above Step-by-step SDF placement (no restoration).
3. Clean the perimeter using your preferred technique (slow-speed round bur, hard-tissue laser, air abrasion, or a spoon excavator).
4. Condition the lesion and surrounding area with 20% polyacrylic acid by scrubbing for 10 seconds (removing the smear layer and activating the surface for ionic exchange).
5. Rinse with water for 10 seconds.
6. Place a matrix if needed.
7. If any contamination occurs, rinse briefly again with water and blot dry with cotton (leaving a moist “glossy” surface).
8. Mix the GIC for 10 seconds and apply immediately, avoiding voids.
9. Shape and remove excess but do not manipulate the GIC after about 30 seconds from start of mix.
10. When crosslinking is initiated, the wet glossy surface of the GIC will start to look “frosty.” This means it is losing water and should be surface sealed with the recommended resin based surface sealant. (do not light cure as it will turn dark from the free SDF.) An alternative to surface sealant is to use petroleum jelly or wet the surface with water.
11. Do not disturb for 2.5 minutes from start of mix. Once set, place anatomy, adjust occlusion, polish with rubber abrasives and discs, ALL with profuse water spray. (see Figure 4)

Note: Ask the patient not to chew on the restoration for a few days, if possible.
Perception of dental professionals

A very common barrier for the use of SDF on children or adults is the perception of dental professionals that parents and patients would never accept SDF treatment because of the discoloration. Yet, when properly educated and informed about the pros and cons of the SDF procedure, many patients choose to have SDF despite the tooth darkening. Is it possible that health-care providers are bothered by the idea of teeth darkening more than patients? A recently published study by Crystal and colleagues looked into parental perceptions of the dark staining of SDF. They found that the dark staining on posterior teeth was more acceptable than staining on anterior teeth, with 67.5% judging the staining as esthetically tolerable in the posterior compared to 29.7% in the anterior (P<.001). However, as the number of children’s behavioral issues increased, so did the parents’ level of acceptance of the staining. Although staining on anterior teeth was undesirable, most of the parents preferred this option to advanced behavioral techniques such as sedation or general anesthesia. Yet, almost one-third of the parents still found the SDF staining unacceptable under any situation.

With regard to esthetics on deciduous teeth, the SDF option could be in many cases presented as an alternative to a stainless steel crown. (see Figure 5)

Conclusion

The supporting science and clinical use of SDF presents a very strong case for the utilization of SDF in appropriate patients and should be in every clinician’s caries management toolkit. The placement of SDF does not preclude additional options that include subsequent placement of restorations for purposes of restoring form, function, or esthetics. Remember that SDF has unique disinfection and remineralization properties that can halt the caries process rapidly and perhaps reduce the need for traditional, more invasive operative procedures. By combining the compatibilities of SDF and conventional GIC, we can offer new ways to medically manage our patients as well as energize and motivate health providers to transform disease to health.

References:


Authors’ Profiles

Judy Bendit, RDH, BS, has more than 45 years of experience in dentistry. She is a speaker, author, clinician, faculty member at the Temple University School of Dentistry, an alumni board member of the University of Pennsylvania Dental School, and an advisory board member for Palm Beach State College’s dental hygiene program. She is also a longstanding member of the American Dental Hygienists’ Association and a distinguished academy member of the Pennsylvania Dental Hygienists’ Association, and she is a volunteer clinician both at home and abroad.

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Questions

1. SDF stands for?
   a. Sodium Dioxide Fluoride
   b. Stannous Diamine Fluoride
   c. Silver Diamine Fluoride
   d. Silver Dioxide Fluoride

2. FDA clearance (which of the following are correct?)
   a. Cleared in 1970
   b. Cleared for caries management
   c. Same breakthrough designation as fluoride varnish
   d. Cleared for treating sensitivity

3. Which of the statements are correct regarding caries disease?
   a. It is a multifactorial disease.
   b. Risk assessment is an integral part
   c. Goal is halting demineralization, supporting remineralization.
   d. All of the above

4. All of the following are required to place SDF EXCEPT:
   a. proper isolation (i.e. cotton rolls)
   b. microbrush and product (SDF)
   c. Dental chair, compressed air, cuspidor, and suction
   d. a caries lesion

5. SDF may decrease the need for which of the following:
   a. Injections
   b. Drills
   c. General Anesthesia
   d. All the above

6. What is the mechanism of action for SDF?
   a. Silver acts as an antimicrobial
   b. Fluoride promotes remineralization
   c. A silver-protein conjugate layer forms, increasing resistance to acid dissolution and enzyme digestion.
   d. All of the above

7. Which of the following statements are true about SDF?
   a. It is minimally invasive
   b. It preserves tooth structure
   c. It halts the disease process
   d. All of the above

8. SDF is which of the following:
   a. 36% weight/volume Ag(NH₃)₂F
   b. 28% weight/volume Ag(NH₃)₂F
   c. 38% weight/volume Ag(NH₃)₂F
   d. 12% weight/volume Ag(NH₃)₂F

9. Which of the following FDA statement is correct?
   a. The FDA classifies SDF as a Class I medical device
   b. The FDA classifies SDF as a Class II cosmetic device
   c. The FDA classifies SDF as a Class II medical device
   d. The FDA classifies SDF as a Class III medical device

10. The CDT 1354 code covers which of the following:
    a. Inactive lesion, asymptomatic
    b. Active lesion, symptomatic
    c. Inactive lesion, symptomatic
    d. Active lesion, asymptomatic

11. The definition of the CDT 1354 code is:
    a. Interim caries arresting medicament application
    b. Topical application of Fluoride
    c. Application of a desensitizing medicament, per visit
    d. Unspecified preventive procedure by report

12. Which of the following is NOT an indication for SDF?
    a. Patients with low risk of caries with no caries lesions
    b. Patients with high risk of caries
    c. Patients with extreme risk of caries
    d. Patients with xerostomia or severe early childhood caries (SECC)

13. Other indications for SDF include?
    a. Patients with active caries lesions with behavioral issues
    b. Patients with active caries lesions with medical management issues
    c. Patients with active caries lesions with limited access to care
    d. All of the above

14. The contraindications for SDF include:
    a. Peanut allergy
    b. Silver allergy
    c. Sodium Lauryl Sulfate (SLS) allergy
    d. None of the above

15. All of the following support use of SDF in the nursing home environment EXCEPT:
    a. Easy to place
    b. Must have suction to place SDF
    c. Takes just a few minutes
    d. Cost effective

16. Clinicians should exercise caution with placing SDF in what instance/s?
    a. If the tooth is symptomatic
    b. Partially necrotic
    c. Pulpally involved
    d. All of the above

17. Which of the following statements are correct?
    a. SDF will not stain countertops and upholstery?
    b. SDF will stain the entire tooth, even if there is no decay?
    c. SDF will only stain where there is decay or demineralization?
    d. SDF will wash out of uniforms if it gets on them?

18. Ideally, the minimum recommended time for the solution of SDF to contact the lesion is:
    a. 10 seconds
    b. 30 seconds
    c. 1 minute
    d. 2 minutes

19. The steps for placing SDF include all of the following except:
    a. Making sure the patient is sitting up for the procedure
    b. Wearing personal protective equipment (PPE)
    c. Placing safety glasses and plastic lined bib on patient
    d. Have an assistant help if possible

20. The following statements about petroleum jelly and lip balm are true EXCEPT:
    a. Helps prevent staining of extra-oral structures
    b. Potentially masks the smell of the solution if placed on lips
    c. It is OK to get into the caries lesion as it will not effect the bonding of any restorative material
    d. Helpful when there are irritations on surrounding soft tissues such as ulcerations or mucositis

21. Which of the following statements best describes the clean-up of SDF?
    a. Just throw everything in the biohazard red trash can
    b. Only invert the gauze in the glove
    c. Put any excess aside so you can use it on the next patient
    d. Invert all cotton, microbrushes and dappen dish into glove and dispose in trash can
Questions

22. Instructions following placement of SDF should include:
   a. Brush teeth immediately after treatment
   b. No eating or drinking for 30 minutes
   c. Must use a RX toothpaste after SDF treatment
   d. No alcohol for 1 week after treatment

23. What does SMART stand for?
   a. silver modified atraumatic restorative treatment
   b. Stannous mediator for atraumatic restorative treatment
   c. Sodium modified atraumatic restorative treatment
   d. Strontium material atraumatic restorative treatment

24. Based on this article what is the ideal restorative material for SMART?
   a. Resin modified glass ionomer (RMGI)
   b. Conventional GIC
   c. Composite
   d. IRM

25. SMART attempts to combine three proven clinical procedures, which one of the following is NOT one of them?
   a. Caries arrest with SDF
   b. Complete caries removal
   c. Partial or incomplete caries removal
   d. Placement of a conventional GIC restoration

26. In cleaning the perimeter of the lesion for SMART which of the following techniques was not mentioned in the article?
   a. Slow speed round bur
   b. Ultrasonic insert
   c. Hard tissue laser
   d. Air abrasion

27. Which statement represents reasonable post-op instructions for SMART?
   a. Ask the patient not to chew on the GIC restoration immediately after placement and ideally for a few days if possible.
   b. Ask the patient to not chew on the restoration for 2 years
   c. No eating drinking or rinsing for 24 hours
   d. Do not brush the restoration with a toothbrush for the first few days

28. All of the following are positive perceptions reported by patients after the SDF procedure EXCEPT:
   a. Easy to place
   b. Did not object to taste or discoloration
   c. Very costly
   d. Painless

29. Informed consent is indicated:
   a. When you have multiple teeth to treat
   b. On every patient
   c. Only if the patient complains about the dark staining
   d. Only when treating the anterior teeth that are visible to the patient

30. Which statement is correct
   a. With the Breakthrough Therapy Designation forthcoming from the FDA, widespread adaptation is forthcoming.
   b. With the Breakthrough Therapy Designation forthcoming from the EPA, widespread adaptation is imminent.
   c. With the Breakthrough Therapy Designation forthcoming from the FDA, widespread adaptation is unlikely.
   d. With the Breakthrough Therapy Designation forthcoming from the ADA, widespread adaptation is imminent.

Notes
Silver diamine fluoride: The newest tool in your caries management toolkit

Name: ____________________________ Title: ____________________________ Specialty: ____________________________
Address: ____________________________ E-mail: ____________________________
City: __________________ State: __________________ ZIP: __________________ Country: __________________
Telephone: Home ( ) Office ( )

Lic. Renewal Date: ____________________________ AGD Member ID: ____________________________

Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 3 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp. For Questions Call 800-633-1681

If not taking online, mail completed answer sheet to:
PennWell Corp.
Attn: Dental Division,
1421 S. Sheridan Rd., Tulsa, OK, 74112
or fax to: 918-831-9804

For IMMEDIATE results, go to www.DentalAcademyOFFLINE.com to take tests online.
INSTANT EXAM CODE 15217
Answer sheets can be faxed with credit card payment to 918-831-9804.

- Payment of $59.00 is enclosed.
- Checks and credit cards are accepted.

If paying by credit card, please complete the following:
- MC
- Visa
- Amex
- Discover

Acct. Number: ____________________________ Exp. Date: ____________________________

Charges on your statement will show up as PennWell

Educational Objectives

1. Understand the mechanism of action of Silver Diamine Fluoride
2. Discuss indications/contraindications for use
3. Identify challenges associated with Silver Diamine Fluoride
4. List steps for Non-Restorative and SMART placement

Course Evaluation

1. Were the individual course objectives met?
- Objective #1: Yes No
- Objective #2: Yes No

2. To what extent were the course objectives accomplished overall?
- 5 Excellent
- 4 Very Good
- 3 Good
- 2 Fair
- 1 Poor

3. Please rate your personal mastery of the course objectives.
- 5 Excellent
- 4 Very Good
- 3 Good
- 2 Fair
- 1 Poor

4. How would you rate the course’s educational methods?
- 5 Highly Effective
- 4 Very Effective
- 3 Effective
- 2 Fair
- 1 Poor

5. How do you rate the author’s grasp of the topic?
- 5 Excellent
- 4 Very Good
- 3 Good
- 2 Fair
- 1 Poor

6. Please rate the instructor’s effectiveness.
- 5 Excellent
- 4 Very Good
- 3 Good
- 2 Fair
- 1 Poor

7. Was the overall administration of the course effective?
- 5 Excellent
- 4 Very Good
- 3 Good
- 2 Fair
- 1 Poor

8. Please rate the usefulness and clinical applicability of the course.
- 5 Excellent
- 4 Very Good
- 3 Good
- 2 Fair
- 1 Poor

9. Please rate the usefulness of the supplemental webliography.
- 5 Excellent
- 4 Very Good
- 3 Good
- 2 Fair
- 1 Poor

10. Do you feel that the references were adequate?
- Yes No

11. Would you participate in a similar program on a different topic?
- Yes No

12. If any of the continuing education questions were unclear or ambiguous, please list them.

13. Was there any subject matter you found confusing? Please describe.

14. How long did it take you to complete this course?

15. What additional continuing dental education topics would you like to see?