



Silver Diamine Fluoride – A Valuable Aid in Caries Management

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Editorial

The issue Dental caries is the most common childhood disease in children in the United States, with 35% of children from ages 2 to 5 years being affected. Most adolescents have decay at the end of adolescence and have adult dental disease later in life [1]. In Karabagh, Southern Armenia; the DMFT is between 8.75 to 9.41 [2]. In an unpublished study by Hand in Hand Dental Clinics in Karabagh, 71% of primary teeth and 73% of permanent teeth had dental caries. The total percentage of children with decayed primary and permanent teeth was 96%. In this group, 66% had between 6 and 11 cavities. Many other areas of the world have similar serious caries issues [3]. The populations with lower socioeconomic status and especially those with special care needs have a higher rate of dental caries than the normal population [4]. The children three and under are the most difficult to manage, and many times their care is ignored or there is a need for pharmacological behavioral management including sedation and general anesthesia in order to accomplish treatment. There is a significant amount of pain and suffering and loss of school time for children, and work time for adults. Loss of income, productivity, and costs of care run into the billions of dollars [5]. Geriatric patients also have root caries with its challenges in managing the restorative components [5]. The barriers to conventional restorative treatment of a) behavioral issues due to age, special needs, b) limited cooperation, c) access to care, and d) financial issues require us to look for other ways to manage dental caries.

History

Combinations of topical silver fluoride products have been used as early as 1840. Such products, such as Silver Diamine Fluoride (SDF), and originally silver nitrate, have been used in Japan for over 40 years to arrest dental caries and lessen tooth sensitivity in primary and permanent teeth [6,7]. In more recent history, many other countries such as Australia and China have used SDF with success. In the 1970's disadvantaged children in South Wales were treated with Silver Fluoride (AgF) as a minimally invasive treatment program to decrease the backlog of dental caries for restoration in a rural area [8,9]. In this study 65% of lesions remained arrested, and only 35% of the lesions needed additional restorative treatment. Milgrom et al., [10] found that 51.7% of children in their study that were treated with SDF had 100% caries arrested. Silver Diamine Fluoride (SDF) has been used around the world to prevent root sensitivity and manage dental caries [11]. In March of 2015 it was approved by the FDA in the United States as a desensitizing agent, and since then has been used as an off-label caries management medication [12]. In October of 2016, SDF was awarded a designation of "Breakthrough Therapy" based on its properties of arresting dental caries in children and adults. SDF is a chemotherapeutic agent that can stop the progression of caries in many situations and aid in the management of dental caries [12]. The composition of SDF is 25% silver, 8% amine, 5% fluoride and 62% water. It is the highest concentration of fluoride available for management of dental caries. The fluoride and silver are made soluble in water by adding ammonia [13]. The effectiveness of SDF is due to its antibacterial properties of the silver, the resulting barrier that is created, and the highest dose of fluoride delivered. The silver ions cause damage to the bacterial cell walls and lead to their death. This results in the precipitated black color and barrier to new decay. Clinical research shows effectiveness in the 30% to 70% range [14]. Acceptance the technique to apply silver diamine fluoride is a simple technique, but specific [15,16]. One drawback of its use is the resulting interaction of the medicament and the dental caries and a precipitation of the silver into the soft caries giving the carious surfaces and any demineralized tooth structure a black color. Acceptance of SDF by patients is mixed, and varies with populations, with 60% of parents approving the black color for posterior teeth, and only 29% for anterior teeth. Silver diamine fluoride will also stain soft tissue, clothes and counters [17]. Therefore, diligent care in its use is

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very important. Acceptance by clinicians is also mixed. Conventional treatment of removing dental caries and restoring tooth structure is still in the majority. Preventive procedures at times are ignored. For example, few dentists apply preventive sealants [18]. A small number of dental schools have taught SDF applications as a procedure, and pediatric dentists are mixed with the use and guidelines on how to treat with SDF [19]. The American Academy of Pediatric Dentistry in 2017 added a guideline on SDF [20,21].

Technique Precautions

- Patient protection is important with plastic lined bibs and glasses.
- Cotton roll isolation is important to keep the tooth dry and protect the gingiva.
- A plastic dapper dish must be used as SDF corrodes glass and metal.
- Minimize contact with soft tissues by applying Vaseline to protect extraoral soft tissues and cotton rolls to protect intraoral soft tissues.

Clinical Application

- Dry affected lesions. Bend micro brush, dip into SDF, and wipe on side of dap pen dish.
- While caries reduction is not necessary, one may remove gross debris from the cavitations to better allow SDF to come in contact with caries.
- Apply only to lesion for 10 sec, not healthy tooth structure.
- Keep dry.
- Dry with air for one minute.
- Remove excess with cotton roll or pellet.
- Continue to isolate for up to 3 min when possible.
- To minimize the metallic silver taste, one may place fluoride varnish over the lesion.
- Carefully dispose of gloves, cotton rolls, micro brush, etc. into plastic waste bag.

Lesions that are cavitated are easier to access and apply the SDF. It is possible to apply SDF inter proximally, but it is more difficult and less predictable. One needs to have the area dried and isolated well, and a piece of Super floss is placed between the teeth. The SDF is placed on the Super floss at the tooth contact and is flossed back and forth between the teeth. There are no post-operative limitations, although some people feel that the 30 min wait time to eat or drink recommended post topical fluoride treatments may give a better result. Reapplication may be necessary to sustain success. Single applications with no reapplication lose effect over time [22-24]. Two applications seem to be more effective than one and three applications more effective than two [23,25]. The University of California San Francisco recommends application twice a year for 2 years without excavation [24,25]. After a month, the tooth can be restored if the patient requests and is adequately cooperative for a more esthetic solution. After application of SDF, there is no effect on the bond strength to non-caries dentin. There is approximately a 1/3 reduction of bond to dentin and some excavation of the superficial dentin is recommended.

Monitoring Commendations

Caries lesions that have been treated with SDF should be monitored after a 2 to 4 weeks period, and if all the caries has not been arrested, reapplication should be considered as necessary. Recare monitoring should be accomplished every 3, 4, or 6 months depending on the Caries Risk Assessment (CRA) of the child. Behavioral intervention with the parent and patient such as oral hygiene instructions, diet counseling, home topical fluoride use, etc. should be implemented to minimize reoccurrences of caries and new lesions. Changes in habit with oral hygiene and diet must be reinforced.

Conclusion

SDF is an additional tool for caries management in a number of clinical situations. While SDF can be effective, if the responsible risk factors for dental caries are not addressed, dental disease may continue. The current availability of SDF provides a new approach that can help in the management of dental caries for very young children, senior citizens, and patients with special care needs. It is easy to apply in the office without sedation or anesthesia. It also can be applied where medical conditions like cancer therapy, or organ transplants preclude immediate restorative treatment, with the use of SDF postponing definitive restorative care for a period of time.

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