

Clinical Implications of Using Silver Diamine Fluoride in Pediatric Dentistry

Doaa Mohammed Banaamah^{1*}, Nedaa Mohammed Banaamah¹, Lujain Mohammed Bajsair², Shyma Sharf Aljefri²
and Saif Ahmed Muraee¹

¹General Dentist, Private Practice, Jeddah, KSA

²General Dentist, Private Practice, Makkah, KSA

***Corresponding Author:** Doaa Mohammed Banaamah, General Dentist, Private Practice, Jeddah, KSA.

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Abstract

Silver Diamine Fluoride (SDF) is chemically formulated as a colorless alkaline liquid that consists of silver particles and fluoride ions. The objective of this review was to discuss the effectiveness of Silver Diamine Fluoride in Pediatric Dentistry as a standard of clinical care. SDF is, therefore, considered a safe, cost-effective treatment for arresting carious lesions in primary dentitions. Clinical data supports the application of SDF around 1 - 2 times per year respectively. SDF might be a valuable therapeutic agent for providing standard care in pediatric dentistry to some extent.

Keywords: Silver Diamine Fluoride; SDF; Silver Diamine Application; Pediatric Dentistry

Introduction

Silver Diamine Fluoride (SDF) is chemically formulated as a colorless alkaline liquid that consists of silver particles and fluoride ions. At pH 10, SDF solution consists of silver (25%), ammonia (8%), fluoride (5%) and water (62%). Thus, it is ultimately referred to as 38% SDF [1]. Silver Diamine Fluoride provides dual functions as a result of its chemical elements that include silver ions and fluoride content. The silver ion acts as an anti-microbial agent and aids in preventing the formation of new biofilm while fluoride ions prevent the demineralization of tooth structure [2,3].

The use of silver diamine fluoride has earned considerable attention for managing dental caries across the globe. SDF is a relatively unique material that has the potential to non-invasively achieve the elusive and clinically significant goal of preventing caries lesions or stop the progression of caries lesions [4]. It also decreases the incidence of new caries lesions [4]. The preventive action of SDF appears to be immediate and is maintained nearly at the same fraction over time [4].

At concentrations of 30% and 38% respectively, SDF thus considered remarkable therapeutic agent and can be used as an alternative treatment option for arresting caries lesion in deciduous dentitions and permanent first molars [5]. SDF is also known for arresting caries lesions in the elderly population [6]. Current evidence supports the use of SDF as part of a comprehensive caries management program in clinical practice [6].

Clinically the application of SDF is time-saving and easy. It's an affordable and safe material. The only drawback associated with using SDF as it stains the caries lesions dark in appearance [6].

It provides dental practitioners with an additional tool for management of caries lesions when esthetics is not a predominant treatment goal especially in the posterior teeth [6].

Objective of the Study

The objective of this review was to discuss the effectiveness of Silver Diamine Fluoride in Pediatric Dentistry as a standard of clinical care.

Overview

Numerous studies have been conducted in recent years that support the use of SDF in clinical practice. According to the available evidence in the literature, clinical trials showed that SDF prevented 61% of new lesions in comparison to the control group. However, enamel lesions tend to respond greater than those of the cavitated dentin lesions. Moreover, SDF applied once per year appeared to be more effective when compared with the topical fluorides and cost-effective than the dental sealants [4].

Literature supports the annual application of Silver diamine to high-risk surfaces such as mesial surfaces of permanent first molars and the distal surface of the second primary molars appeared to be the most cost-effective treatment modality available to prevent caries lesions. Some authors conclude that SSF is an underutilized evidence-based treatment procedure for dental caries [4].

SDF can be considered as alternative care for patients when conventional restorative treatment is not available especially for patients with special care needs [7].

American Dental Association (ADA) recommendations

The expert panel recommends dental practitioners to prioritize using 38% SDF solution biannually for arresting advanced cavitated lesions especially those present on the coronal surfaces of primary teeth [8].

Indications

SDF actively arrests the carious lesions painlessly without the administration of local anesthesia. This material can be applied to the surfaces of the tooth as soon as caries are detected [9]. It's indicated in patients when general anesthesia is contraindicated [9]. It might act as a beneficial therapeutic agent for treating the caries lesions in "very young pre-cooperative children or persons with intellectual/developmental disorders" [9].

Contraindications

Dental literature didn't report any adverse events related to the use of silver compounds [10]. Silver allergy might be the only documented adverse events so far. Moreover, teeth with evidence of pulpitis or pulpal conditions are not appropriate for the SDF application [10]. Similarly, teeth with deep carious lesions (caries dentin is excavated) are not indicated for SDF therapy due to the presence of ammonia component and high pH which may induce pulpal reaction [10].

Clinical technique

University of California San Francisco (UCSF) has suggested a protocol to use SDF in clinical practice [10]:

- This usually starts with initially drying the lesion during the SDF application. Then most importantly, isolation should be performed using gauze or cotton rolls [10].
- The purpose of drying and isolation before applying SDF is to improve the effectiveness [10].

- Lately, 1 - 3 minutes is usually required for SDF to fully soak into and react with a cavitated lesion which is the predictable time for the success [10].
- However, only a few seconds of SDF application is enough for very young patients due to the cooperation limits that commonly result in an arrest [10].
- Whereas the application time in clinical trials doesn't correlate to an outcome predictability. UCSF committee suggested precautions should be considered for initial use [10].
- Prolonged absorption time also decreases concerns regarding removing SDF with a post-treatment rinse [10].
- Excessive SDF material should be removed with the same cotton roll that is used for isolation to minimize the systemic absorption of SDF [10].
- SDF can be applied on the first dental visit, then at consecutive 1 and/or 3 months follow-ups, including semi-annual recall visits (6, 12, 18, 24 months) respectively [10].

Drawbacks

Silver diamine applied to carious lesions or other oral mucosa, lips and skins might cause significant irreversible black staining or discoloration due to the formation of silver oxide [11]. Superficial black color discoloration of the oral mucosa and skin usually resolves within days as epithelial cells slough off. Therefore, SDF is applied carefully under a controlled clinical environment only by trained, skilled providers [12].

The material was approved by Food and Drug Administration (FDA) as a desensitizing agent and has been used off-label to treat carious lesions [12,13] SDF is known to produce discoloration darker in color than the original which is the major drawback of the material [12,13]. Recently, a nanoparticle-sized silver material was introduced that has the same dual functions without causing discoloring effects [14].

Conclusion

SDF is, therefore, considered a safe, cost-effective treatment for arresting carious lesions in primary dentitions. Clinical data supports the application of SDF around 1 - 2 times per year respectively. SDF might be a valuable therapeutic agent for providing standard care in pediatric dentistry to some extent.

Conflict of Interests

The authors display no conflict of interests.

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