

Does Silver Diamine Fluoride Effective in Caries Prevention in Children?

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Abstract

This article has focused on the evaluation of the scientific evidence of the effectiveness of silver diamine fluoride (SDF) in caries prevention and caries arresting in both the primary and the permanent teeth in children. The candidates for SDF treatment are selected based on some criteria through a complete dental examination.

Keywords: *Silver Diamine Fluoride; Caries Prevention; Criteria; Dental Examination; Caries Arresting; Primary and Permanent Teeth; Treatment*

Introduction

From a long time ago, dental caries was a problem that humanity suffered from. This is a problem among children who have bad feeding habits, having poor oral hygiene or living in low socioeconomic communities are very common. Although the researchers have used a lot of efforts to find a solution for that, they have not been very successful so far. Since the introduction of Silver diamine fluoride (SDF) into the dental community, the tendency to use this dental material among pediatric dentists has increased significantly.

Silver diamine fluoride is also introduced as diamine silver fluoride, silver fluoride, and silver ammonium fluoride [1]. SDF is a topical medicament used to treat and prevent dental caries; it is also prescribed for relieving dentinal hypersensitivity [2]. After approval of SDF by the Food and Drug Administration (FDA) for tooth desensitization in 2014, the permission was given to the dental society to use it as topical agent for caries control in the USA [3]. It is a clear liquid medicament agent which contains 24.4 - 28.8% silver and 5.0 - 5.9% fluoride at a pH of 10.4 [1].

It is reported that application of sodium diamine fluoride is safe in both children and adults. No serious complications are indicated from the use of SDF, except the allergic reactions to silver [4-7]. The small disadvantage of using this substance is the black stained teeth. The procedure is a painless one which proves to be effective in caries arrest [4,5,8-10]. It is not required to remove caries before the application of sodium diamine fluoride [11]. The effectiveness of SDF is twice that of fluoride varnish [9,11].

Each child cannot be a candidate for SDF treatment. There are some criteria to be considered for selecting individuals who are going to be treated by silver diamine fluoride, only through the dental examination. Even though the efficacy of SDF is obvious in caries prevention and arresting caries, but the main role of oral hygiene should be taken into account.

Mechanism of action

The proposed mechanism is described by obturation of dental tubules. While silver and fluoride ion penetrates into the dentin [12], fluoride stimulates re-mineralization by the formation of Fluorapatite. This action increases dentin hardness and prevents dental caries

[13]. Yamaga and his co-workers suggest silver ions act mainly on cariogenic bacteria [13]. It inhibits demineralization and promotes the remineralization of demineralized enamel and dentine. It also blocks the breakdown of the dentine collagen [1]. By blocking dentinal tubules, the desensitizing action occurs in treated teeth [14].

Clinical applications

For a few decades, silver diamine fluoride has become popular in dental treatment. SDF has been used as a caries-arresting and anti-hypersensitivity medicament in some countries in Asia, including Japan and China [7]. Although SDF is used in countries in Asia and South America, SDF has not yet been approved for use in many European countries [15].

Here are the most important patients who are appropriate candidates for SDF treatment [5,16,17]:

- Young children with SECC whose parents are not willing them to be undergone sedation or general anesthesia for restorative treatments.
- Management of difficult young children with behavioral and medical issues.
- Patients with special needs.
- Patients who need extensive restorative procedures.
- Patients with multiple carious lesions (hard to be treated in one session).
- Patients with high caries prevalence (Xerostomia).
- Patients who had radiation therapy (in case of oral cancer).

Clinical criteria for the application of SDF [17]

There are some criteria should be considered prior to the use of silver diamine fluoride:

- a. The carious lesion should have affected the dentin, not just the enamel.
- b. The pulp should not be penetrated by caries.
- c. The absence of Radiolucency (periapical or intraradicular).
- d. SDF is appropriate for any surface on any tooth with the above criteria.

Contraindication [5,17]:

1. Allergy to silver
2. Pregnancy
3. Breastfeeding
4. Ulcerative gingivitis
5. Stomatitis.

Pros and cons of silver diamine fluoride

Although the use of SDF has become popular among pediatric dentists, mention of positive and negative points about this substance will be worthwhile for young dental practitioners.

SDF can be used at various locations, including dental offices, dental clinics, and oral health centers. This drug combination is inexpensive and a drop of it is enough to treat multiple teeth [4,5]. Its application is very easy, and dental assistants and dental hygienists can also use it [5,18,19]. Moreover, is completely safe and effective [5,18,19].

This treatment is recommended for some particular people. It is not contraindicated if a dentist decides to apply this substance for a child who has teeth decays on all of his teeth. It's also a good option for people who are having trouble getting regular care. SDF is the most effective method for preventing decay after fissure sealants, but the sealant is more expensive than it is and requires periodic examinations [21,22].

On the other hand, some of the disadvantages of this approach are as follows.

This natural antimicrobial agent can reduce the taste of the mouth and increase the inflammation of the gum tissue when in contact with it [5,9]. However, the dentists apply special precautions to prevent its contact with the surrounding tissues. If the child is allergic to silver compounds, the dentist should be informed by the parents before starting the treatment.

Review of some research

Some researchers have investigated the effectiveness of SDF on the prevention of dental caries. Here are some of them that might lead to a new evolution in the prevention and restorative dentistry in the future. Even though the effectiveness of SDF on prevention and stopping of dental caries has been reported in some cases, more studies are needed to reach the definite effectiveness of silver diamine fluoride.

The database of this research indicates that SDF can be used as a preventive treatment for dental caries in community settings. This study also indicates SDF has the potential as an alternative treatment for caries arrest in both primary and permanent molars [22].

In two studies one conducted by Dos Santos, *et al.* and the other one conducted by Mones, *et al.* they compared the effectiveness of SDF with temporary restorations in the arrest of dental caries [23,24].

SDF review articles have recommended the use of a 38% concentration intervention for prevention and arrest of dental caries in children [5,8,25-27].

Based on the findings from 2 studies conducted by Horst, Jeremy A., *et al.* and Gao SS., *et al.* We can reach this conclusion concerning silver diamine fluoride. First, SDF presents a noninvasive procedure for caries arrest and treatment if it is applied to dentin caries lesions, directly.

Second, use of silver diamine fluoride should be replaced in a preventive oral health program. If resources are available, it should be combined with other preventive programs such as using varnish fluoride for remineralization of early caries lesions, and application of fissure sealants.

Third, Dental practitioners should be aware of the indications and contraindications. Following the manufacturer directions for use; obtaining the informed consent before using SDF are the other criteria that should be considered.

Fourth, silver diamine fluoride might provide a substitution for treating patients having difficulties with dental care.

The findings of all reviews also indicated that SDF was effective in caries prevention in children and the elderly [5,8,22-27].

Conclusion

Silver diamine fluoride has shown interest in a few last decades due to its remineralization capacity and non-invasive application procedure. Some researches indicated that SDF might be a successful treatment for arresting caries; prevent the occurrence of new carious lesions.

It is considered a dental procedure which is cheap, quick and simple to apply which has great potential, especially for early childhood caries. Other candidates such as fearful adults, both children, and adults with special needs, patients with salivary dysfunction, and patients who challenged by behavioral or medical issues, can benefit from this treatment.

In addition, SDF application does not require complex training of the dental or health professionals. Silver diamine fluoride is more effective as a preventive measure to dentinal caries compared with other types of fluoride application. The only disadvantage of using SDF is that the lesion will be stained black.

A review concluded that SDF is a safe, effective, efficient, and equitable caries control agent that has a potentially broad application in dentistry.

In spite of this, the best way to prevent oral and dental diseases is to continue to adhere to the principles of health care.

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