DOI: 10.7860/JCDR/2023/65801.18360

Case Report

Dentistry Section

Management of Accidental Chin Staining following Silver Diamine Fluoride Application in a 24-month-old Girl: A Case Report

VIPUL CHANDRAPRAKASH LODHA[1], LARESH N MISTRY[2]

ABSTRACT

Silver Diamine Fluoride (SDF) is a clear liquid that combines the remineralising effects of fluoride with the antibacterial effects of silver. It is a promising therapeutic agent for managing carious lesions in young children and those with special care needs. However, a major complication of SDF is black staining of the skin, mucosa, lips, tongue, and cheeks if improperly applied. This case report presents a complication following SDF application and its management. A 24-month-old girl presented with decayed teeth in the upper back tooth region of the jaw, and SDF application was performed on tooth no. 54 and 64. However, due to the child's extremely negative behavior and movement during the application of SDF, staining occurred on the chin and lower lip a few hours later. Watchful observation, patient reassurance, and follow-up led to adequate patient management.

Keywords: Caries arrest, Casein phosphopeptide-amorphous calcium phosphate, Dental caries, Early caries, Tooth remineralisation

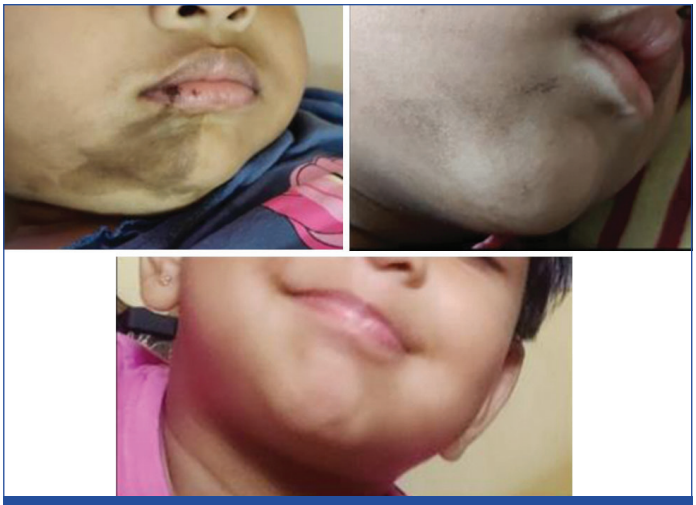
CASE REPORT

A 24-month-old girl presented with a chief complaint of decayed teeth in the upper left and right back tooth region. No history of pain or swelling was reported with the decayed teeth. There was no relevant past medical history. The patient was bottle-fed until the age of 18 months, and no sugar was given to the child. The patient occasionally used fluoridated toothpaste (500 ppm) for brushing teeth. The Frankl's behaviour rating was definitively negative [1].

During the examination, the mother was asked to hold the child due to her definitely negative behaviour. It was observed that teeth 54 and 64 had occlusal surface caries. There was no pulpal involvement, abscess, or mobility associated with these teeth. Radiographs were not taken as the caries only involved enamel and dentin, and the child's behaviour was extremely negative. The treatment plan involved interim 38% SDF application until the child's cooperation could be achieved, followed by Glass Ionomer Cement (GIC) restoration.

During the next appointment, the patient's behaviour was extremely negative (--), so the mother was asked to stabilise the child. Petroleum jelly was applied to the lips, tongue, buccal mucosa, palate, and skin. A drop of SDF was dispensed into a dappen dish and loaded onto the applicator tip. After proper isolation with a cotton roll, SDF was applied to tooth no. 54 for 2-3 minutes, and the same procedure was repeated with tooth no. 64 [2]. The patient was discharged from the dental clinic after the application of SDF.

After three hours, the patient reported black stains on the chin and lower lip via telephonic communication [Table/Fig-1a]. Photographs of the stains were obtained from the parents. After proper evaluation, the parents were informed about the accidental staining caused by SDF and reassured that the stain would disappear within a week. The patient was followed-up every day until the stain completely disappeared. In three days, the staining reduced [Table/Fig-1b], and on the 7th day, the black stain had completely disappeared [Table/Fig-1c]. The caries on teeth 54 and 64 were arrested with the help of SDF.



[Table/Fig-1]: a) One day later; b) Three days later; c) One week later.

A remineralising paste containing Casein PhosphoPeptide-Amorphous Calcium Phosphate (CPP-ACP) [3] was recommended for home application two to three times a day. The patient was advised to avoid sugar between meals and reduce free sugar consumption in the diet. Other home care measures, such as brushing twice a day with toothpaste containing an optimal fluoride concentration and an adequate amount of toothpaste, were also explained [Table/Fig-2].

Home measures	Office measures
Cleaning oral cavity with soft bristle tooth-brush and junior fluoride toothpaste Avoid sugar consumption in between the meals	Preventive measures- Topical fluoride varnish application bi-annually SDF application on carious teeth

[Table/Fig-2]: Overall treatment summary.

DISCUSSION

Dental caries, being the most common chronic infectious disease of childhood, is caused by the interaction of bacteria with food substrates in the oral environment [4]. Newer minimally invasive methods of caries management include CPP-ACP,

Chlorhexidine (CHX) application, varnish application, SDF application, and stabilised aqueous silver fluoride solution (AgF) [5], among others.

SDF combines the remineralising effects of fluoride and the antibacterial effects of silver (253,900 ppm). SDF is used to arrest dental caries in both children and adults. Fluoride helps promote the remineralisation of hydroxyapatite in enamel and dentin. It has also been shown to reduce *Streptococcus mutans (S. mutans)* in treated surfaces [6]. Treatment with SDF is non invasive as no removal of carious tissue is necessary before the application of SDF [7]. This suggests that dental practitioners do not need to remove caries from patients' teeth during treatment with SDF. The lesion depth of a demineralised tooth surface decreases after the application of SDF and also slows down the progression of lesions. A recent meta-analysis concluded that SDF effectively arrests caries, and this conclusion is strongly supported by high levels of evidence [8].

Demineralised tooth surfaces become black after SDF application. Staining of carious lesions black and a metallic taste are the two most commonly reported complications following SDF application. The reaction of silver phosphate and silver sulfide forms a reactive product that causes black staining after application [8]. Accidental contact of SDF with the lips or skin results in rapid red-brown discoloration, which may take several weeks to disappear. SDF has the ability to stain clothes and skin. Although it does not cause pain or damage, the stains caused by SDF are not easily washed away. On the skin, the stains typically disappear in around seven days, while stains on clothes are permanent [9]. These complications are transient and self-manageable.

Prior to the application of SDF, written informed consent was obtained, which includes information about the benefits and risks of SDF. In cases of complications like this, it is important to address the patient's fears and calmly explain the transient nature of the problem. Such communication is better done in person rather than over the phone, as it allows for answering multiple questions and providing reassurance. If the issue of soft tissue staining is not promptly addressed with attention given to the child and parent, it can lead to a frenzied situation involving consultation with multiple specialists such as a pediatrician, general physician, dermatologist, and cosmetologist, resulting in unnecessary and exhausting communication. The authors would like to emphasise that such a complication has not been reported, and this case can provide evidence to alleviate patients' fears and serve as a guide to approach this treatment with caution.

According to Gao SS et al., the rate of caries arrest with 38% SDF was 86% at six months, 81% at 12 months, 78% at 18 months, 65% at 24 months, and 71% at or beyond 30 months. The overall proportion of arrested dental caries after SDF treatment was 81% (95% CI, 68% to 89%; p<0.001). Staining of arrested lesions black was the only complication reported among the 19 studies included in the systematic review [10]. Nowadays, SDF is also used alone or in combination with other biological approaches such as a topical fluoride application, Atraumatic Restorative Technique (ART), interim therapeutic restorations, and Hall technique preformed metal crowns [11,12]. In a randomised trial by Ballikaya E et al., in 2021 on Molar Incisor Hypomineralisation (MIH), both SMART sealants and SDF showed similar effectiveness in reducing hypersensitivity and arresting enamel caries in hypomineralised molars [13].

In different community-based dental programs, SDF is used as a non invasive strategy to treat dental caries [14]. Potassium iodide (KI) helps prevent staining by precipitating excess silver ions as white silver iodide. A systematic review by Roberts A et al., stated that the application of KI after SDF might have the potential to reduce staining caused by SDF [15]. However, the authors cannot verify if KI has the potential to reduce mucosal or dermal staining as seen in this case. Therefore, it is recommended that in the event of such a complication, the use of KI may provide further possibilities for managing dermal and mucosal staining, in addition to reassurance.

As an alternative treatment to control decay, the American Dental Association recommends semi-annual application of fluoride varnish as an effective measure in the primary and permanent dentition of children and adolescents [16]. The ART is another alternative for caries control; however, it does not involve the use of SDF, whereas SDF has shown strong caries arresting, collagen preserving, and antibacterial effects that may not be achieved by Resin-Modified Glass Ionomer Cement (RMGIC) alone. In this case, the primary goal was to arrest active dentin caries because the patient's age and behavior were not suitable for definitive restoration; therefore, this interim treatment was selected. Another alternative could be treatment under sedation or general anaesthesia.

CONCLUSION(S)

To our knowledge, this is the first case report mentioning staining on the skin caused by SDF application. Adequate patient reassurance about the reversible nature of staining is necessary. Follow-up plays an important role in the management of such mishaps as it allows the clinician to determine whether the treatment provided needs to be modified.

REFERENCES

[1] Riba H, Al-Zahrani S, Al-Buqmi N, Al-Jundi A. A review of behavior evaluation scales in pediatric dentistry and suggested modification to the Frankl scale. EC Dental Science. 2017;16(6):269-75.

[2] Yan IG, Zheng FM, Gao SS, Duangthip D, Lo EC, Chu CH. A review of the protocol of SDF therapy for arresting caries. Int Dent J. 2022;72(5):579-88. 2022 Jul 14.

[3] Wu L, Geng K, Gao Q. Early caries preventive effects of Casein Phosphopeptide-Amorphous Calcium Phosphate (CPP-ACP) compared with conventional fluorides: A meta-analysis. Oral Health Prev Dent. 2019;17(6):495-503. Doi: 10.3290/j.ohpd.a43637. PMID: 31825022.

[4] Selwitz RH, Ismail AI, Pitts NB. Dental caries. The Lancet. 2007;369(9555):51-59.

[5] Turton B, Horn R, Durward C. Caries arrest and lesion appearance using two different silver fluoride therapies on primary teeth with and without potassium iodide: 12-month results. Clinical and Experimental Dental Research. 2021;7(4):609-19.

[6] Zhao IS, Gao SS, Hiraishi N, Burrow MF, Duangthip D, Mei ML, et al. Mechanisms of silver diamine fluoride on arresting caries: A literature review. International Dental Journal. 2017;68(2):67-76. Doi:10.1111/idj.12320.

[7] Zheng FM, Yan IG, Duangthip D, Gao SS, Lo ECM, Chu CH. Silver diamine fluoride therapy for dental care. Jpn Dent Sci Rev. 2022;58:249-57. Doi: 10.1016/j.jdsr.2022.08.001. Epub 2022 Sep 7. PMID: 36097560; PMCID: PMC9463534.

[8] Surendranath P, Krishnappa S, Srinath S. Silver Diamine Fluoride in preventing caries: A review of current trends. Int J Clin Pediatr Dent. 2022;15(Suppl2):S247-51. Doi: 10.5005/jp-journals-10005-2167. PMID: 35645531; PMCID: PMC9108851.

[9] Chu CH, Lo EC. Promoting caries arrest in children with silver diamine fluoride: A review. Oral Health & Preventive Dentistry. 2008;6(4):6(4):315-21.

[10] Gao SS, Zhao IS, Hiraishi N, Duangthip D, Mei ML, Lo EC, et al. Clinical trials of silver diamine fluoride in arresting caries among children: A systematic review. JDR Clinical & Translational Research. 2016;1(3):201-10.

[11] Hu S, Meyer B, Duggal M. A silver renaissance in dentistry. Eur Arch Paediatr Dent. 2018;19(4):221-27. Doi: 10.1007/s40368-018-0363-7.

[12] Crystal YO, Marghalani AA, Ureles SD, Wright JT, Sulyanto R, Divaris K, et al. Use of silver diamine fluoride for dental caries management in children and adolescents, including those with special health care needs. Pediatric Dentistry. 2017;39:E135-45.

[13] Ballikaya E, Ünverdi GE, Cehreli ZC. Management of initial carious lesions of hypomineralized molars (MIH) with silver diamine fluoride or silver-modified atraumatic restorative treatment (SMART): 1-year results of a prospective, randomized clinical trial. Clin Oral Investig. 2022;26(2):2197-205.

[14] Gao SS, Amarquaye G, Arrow P, Bansal K, Bedi R, Campus G, et al. Global oral health policies and guidelines: Using silver diamine fluoride for caries control. Frontiers in Oral Health. 2021;2:685557.

[15] Roberts A, Bradley J, Merkley S, Pachal T, Gopal J, Sharma D. Does potassium Iodide application following Silver Diamine Fluoride reduce staining of tooth? A systematic review. Australian Dental Journal. 2020. Doi: 10.1111/adj.12743.

[16] Zhang J, Sardana D, Li KY, Leung KC, Lo EC. Topical fluoride to prevent root caries: Systematic review with network meta-analysis. Journal of Dental Research. 2020;99(5):506-13.

PARTICULARS OF CONTRIBUTORS:
1. Postgraduate Student, Department of Paediatric and Preventive Dentistry, Bharati Vidyapeeth Deemed to be University Dental College and Hospital, Navi Mumbai, Maharashtra, India.
2. Associate Professor, Department of Paediatric and Preventive Dentistry, Bharati Vidyapeeth Deemed to be University Dental College and Hospital, Navi Mumbai, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Vipul Chandraprakash Lodha,
A-1602, Bhumiraj Hermitagw, Sector 18, Sanpada, Navi Mumbai, Maharashtra, India.
E-mail: vipullodha1313@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jun 05, 2023
- Manual Googling: Jul 13, 2023
- iThenticate Software: Aug 16, 2023 (11%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Jun 03, 2023**
Date of Peer Review: **Jul 05, 2023**
Date of Acceptance: **Aug 19, 2023**
Date of Publishing: **Sep 01, 2023**