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Original Article

Assessing Parental Acceptance to Silver Diamine Fluoride Staining in Anterior and Posterior Teeth of Children in A Group of Egyptian Parents

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Abstract

Background: Silver diamine fluoride (SDF) is a beneficial therapy for caries arrest for young uncooperative children to escape more advanced behavioural management techniques with its complications. This study (Self controlled clinical trial) was conducted to evaluate parental acceptance of silver diamine fluoride (SDF) treatment with its black staining.

Subjects and methods: A group of 41 children with their parents were selected randomly from the clinic of pediatric dentistry and dental public health department of Ain shams university. Application of SDF was carried out for each child then parental acceptance was assessed using Likert scale

Results: For anterior teeth, 22 parents (53.7%) agreed to the treatment. For posterior teeth 25 parents (60.9%) agreed to the treatment. Analyzing these data showed that the difference in acceptance of SDF staining for anterior and posterior teeth was statistically significant (P=0.041).

Conclusion: Most of the parents agreed to SDF treatment despite of its black staining to escape more advanced behavioural management techniques. Acceptance of SDF staining in posterior teeth was higher than that in anterior teeth.

Keywords: Parental acceptance ; Silver diamine fluoride; staining

Introduction

Dental caries is one of the most prevalent diseases in children across the world(Mathur and Dhillon, 2018). It can affect speech, mastication, smile and quality of life for both children and families. (Ozsin Ozler, Cocco and Cakir, 2020).

Dental decay is a hard dental tissues disease. It has been related to many factors. It is mainly caused by fermentation of carbohydrates like sucrose by oral micro-organisms especially lactobacilli and streptococci. It starts with a small subsurface demineralization (Chu, Zhang and He, 2016), then it progresses to cavitation followed by pulp affection , swelling and abscess formation. Caries in children below 6yrs is called early childhood caries (ECC)(Anil and Anand, 2017) .The treatment of dental diseases is expensive in all countries and prevention is effective and very simple.

Minimally invasive dentistry (MID) adopts the philosophy that merges prevention, remineralization and minimal intervention for the replacement and placement of

restorations(Showkat *et al.*, 2020). Minimally invasive dentistry uses the least invasive surgical approach to reach the treatment goals by removing minimal amount of healthy tissues(Jingarwar, Bajwa and Pathak, 2014).

MID approaches include atraumatic restorative technique (ART), air abrasion, oscillating systems, rotary instrumentation and Silver Diamine Fluoride (SDF) (Mendiratta *et al.*, 2021).

Silver diamine fluoride (SDF) is a promising therapeutic agent for caries management which combines the antibacterial effect of silver and the remineralizing effect of fluoride in carious lesions in young children and those with special care needs (Doppalapudi, 2020).Many systematic reviews substantiate SDF's efficacy for caries arrest in deciduous teeth.

In 2014, US Food and Drug Administration cleared SDF for hypersensitivity. The use of SDF as preventive or therapeutic treatment can prevent or delay treatment till a child becomes more cooperative. It is a nonsurgical approach to manage caries in populations where surgical management of decay is not possible (Burgess and Vaghela, 2018) .

The use of 38% SDF has proven to be effective and safe in controlling dental caries in children. The tooth acts as fluoride reservoir and increases its long-term efficacy. SDF arrests caries in two ways. First as an antimicrobial, silver reacts with thiol groups of nucleic and amino acids, disrupting metabolic pathway of bacteria causing cell death , second it reacts with hydroxyapatite to form fluorapatite preventing any future caries(Jonas and Crawford, 2017) .When SDF is applied, it penetrates both enamel and dentin, and about 2 times more subsurface fluoride is stocked within the tooth than other fluoride forms(Cláudia Rodrigues Chibinski, 2021).

As most of the medicaments, SDF has its drawbacks. On top of these drawbacks is staining. It causes dark stains on enamel and dentin, which may raise esthetic concerns. However, parents have different attitudes toward the use of SDF. New published studies measured the parental acceptance of using SDF on their child's teeth. Although the staining associated with its application was the main problem , many of them accept SDF treatment over surgeries and other advanced behavioural management techniques. (Othman *et al.*, 2019) so the aim of the study is to evaluate parental acceptance of silver diamine fluoride (SDF) treatment with its black staining.

Subjects and methods

A group of 41 children with their parents were selected randomly according to certain inclusion criteria from the clinic of pediatric dentistry and dental public health department of Ainshams university. Demographic data was also taken from patients and their parents.

Study Design

Self-controlled clinical trial was conducted in which each patient serves as his or her own control as each child received SDF treatment in both anterior and posterior carious teeth like split mouth technique.

Ethical Considerations

The study protocol granted ethical approval from Ain Shams University Research Ethics Committee (FDASU-REC).

Sample size estimation

Sample size calculation was performed to test whether there is a significant difference in parent satisfaction before and after placing SDF. Sample size calculation was performed using G*Power software version 3.1.4 for MS Windows. The minimum accepted sample size was found to be 26 children, by assuming an α level of 0.05 and β level of 0.1 (power = 90%). The effect size dz was estimated to be (0.7) based on the findings of **M.**

Jiang, et al (Jiang *et al.*, 2019)f., and the allocation ratio was set at 1. The final sample size was 41 children as all children and their caregivers who accepted to consent were allocated in the study.

Informed consent and assent

A signed informed consent to the parents' and also an assent to child, outlined by the Ethical Committee, Faculty of Dentistry, Ain Shams University was obtained before the conduction of the study.

Inclusion criteria:

a) Uncooperative children with score 3&4 in Frankl's behavior rating scale aging from 3 to 7 years.

b) Children whose parents refuse or cannot afford the cost of GA surgeries.

c) Teeth that doesn't need full coverage.

d) Teeth which are free of symptoms of pulpal pathology.

e) Each child should have at least one carious asymptomatic anterior and also posterior tooth.

Exclusion criteria:

a) Children whose parents totally refuse silver diamine fluoride staining.

b) Children suffering from medical conditions that can't be managed in the clinic.

c) Children with allergies to silver products.

d) Children with teeth suffering from severe forms of hypoplasia.

Before applying any procedures medical history for each child for any silver products allergy (SDF allergy) was assessed by the help of his parents.

Study procedures

Each child of total number of 41 children received SDF treatment in both anterior and posterior carious teeth by

1) Excavation of soft carious debris with sharp excavator to allow better contact of SDF with dentin.

2) Selected teeth were cleaned, dried and isolated.

3) Petroleum jelly was applied to surrounding soft tissues to minimize their staining with SDF.

4) 38% SDF was applied to carious lesions by microbrush on the affected surface with application time around 1 minute.

5) Gentle flow of air was applied to accelerate drying. The lesion was left isolated for about 3 minutes if possible. Excess SDF was removed with cotton pellet to decrease systemic absorption('Chairside guide: Silver diamine fluoride in the management of dental caries lesions', 2018). (Figures 1, 2, 3, 4)

After silver diamine fluoride application

Assessment of parental acceptance of staining was done though a 5-point Likert scale for each anterior and posterior teeth separately (Bagher *et al.*, 2019).

The format of the five-point Likert scale:

(1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree)

Statistical analysis

Categorical and ordinal data were presented as frequency and percentage values. Ordinal data were analyzed using Wilcoxon signed-rank test.

Results

For anterior teeth, 22 parents (53.7%) agreed to the treatment. For posterior teeth 25 parents (60.9%) agreed to the treatment. Analyzing these data showed that the difference in acceptance of SDF staining for anterior and posterior teeth was statistically significant (P=0.041). (Table 1)

By analyzing demographic data that affected parental acceptance for the treatment as parental gender age, educational level and income. This study revealed that there was a significant association between parental acceptance and gender with the percentage of female parents disagreeing to the treatment being significantly higher than males.

There was no significant correlation between parental acceptance and parental age as well as educational level and family income.

Discussion

SDF (38%) contains a high concentration of fluoride ions; 44,800 ppm(Seifo, Robertson and MacLean, 2020) . When placed on carious tooth tissue, a series of chemical reactions take place that promote carious lesion arrest and tooth desensitisation by blocking dentinal tubules in children who are high caries-risk or having progressing carious lesions, those who are unable to tolerate invasive treatment and those who are medically compromised or have additional care and support needs(Fung, Duangthip and Wong, 2016). In Egypt there is no sufficient data about parent's attitude towards SDF, so the aim of this study was to assess parental acceptance of SDF treatment and to determine if parent's level of acceptability of SDF black stain would change according to the location of teeth.

Soft carious debris excavation was carried out to allow for better penetration of SDF with carious dentin(Pradeepika Liyana Arachchige, Sultan and Herath, 2021). Excavation of carious dentin is not necessary but it reduces the black stain for SDF and considered for esthetic purpose.('Chairside guide: Silver diamine fluoride in the management of dental caries lesions', 2018). Petroleum jelly was applied to soft tissues before SDF application to prevent temporary staining of soft tissues. SDF was applied directly to the affected area of the tooth only and excess was removed to decrease systemic absorption(Mishra *et al.*, 2021).

Some considerations were taken to avoid bias in the study where all children received the same treatment in both anterior and posterior teeth (self-controlled clinical trial). All clinical procedures were carried by the same operator throughout the whole study. Acceptance of staining to anterior and posterior teeth separately were assessed through Likert scale by another investigator rather than the operator. All data were analyzed by neutral statistician who doesn't know about the intervention.

The present study showed parents agreed to the treatment by (60.9%) for posterior teeth and by (53.7%) for anterior teeth and the difference in acceptance between anterior and posterior teeth was statistically significant where acceptance of SDF staining in posterior teeth was higher than that in anterior teeth due to the location of posterior teeth which doesn't compromise the esthetics like anterior teeth.

These results also showed that most of the parents agreed to SDF treatment with its black staining and compromised the esthetics in order to avoid more advanced behavioural management techniques as general anesthesia.

These findings are supported by a study of **Yasmi O Crystal et al;2017** (Crystal *et al.*, 2017) that showed that many parents were open to compromise esthetics in favor of a using a less invasive approach where child's cooperation is a barrier treatment .However, the study reported a significant difference in acceptance between anterior and posterior teeth

This study comes in accordance with **N A Salim et al .,2021**(Salim *et al.*, 2021) carried out a study for parental acceptance among Syrian refugees that showed that acceptance was related to the type and location of teeth, being higher for primary than permanent teeth, and posterior than anterior teeth. Acceptance was also related to parental age and level of education.

Fig (1): Before SDF application

Fig (2): Black staining after SDF

Fig (3): Before SDF application

Fig (4): Black staining after SDF

Table 1: Frequency and percentage values for parental acceptance after application of SDF for anterior and posterior teeth.

Parameter		Anterior teeth	Posterior teeth	P-Value
Strongly disagree	**n**	1	0	**0.041**
	%	2.4%	0.0%	
Disagree	**n**	7	5	
	%	17.1%	12.2%	
Neutral	**n**	11	11	
	%	26.8%	26.8%	
Agree	**n**	18	19	
	%	43.9%	46.3%	
Strongly agree	**n**	4	6	
	%	9.8%	14.6%	

On the other hand, the findings of the present study were not in consistence with that of **Abdullah Faraj Alshammari et al; 2019** (Faraj *et al.*, 2019). The study showed that the majority rejected SDF treatment because they were aware of other treatment options provided in primary health care that give better esthetic results. There was a difference in acceptance to the treatment between anterior and posterior teeth.

It`s worthy to note that from the limitations of this study was that due to small sample size and lack of diversity among the study participants being all recruited from one clinic and according to strict eligibility criteria, the study findings can`t be generalized to different populations. Another limitation was that further studies are needed to evaluate the efficacy of SDF in caries arrest for long period of time.

This study showed the benefit of SDF treatment as it offered an effective treatment for many teeth in a short period of time with lower cost compared to other advanced techniques as GA. It is believed that it can offer treatment for many areas who suffer from lack of facilities or accessibility to a dental clinic as its application is simple and fast.

Conclusion

Most of the parents agreed to SDF treatment despite of its black staining to escape more advanced behavioural management techniques. Acceptance of SDF staining in posterior teeth was higher than that in anterior teeth.

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