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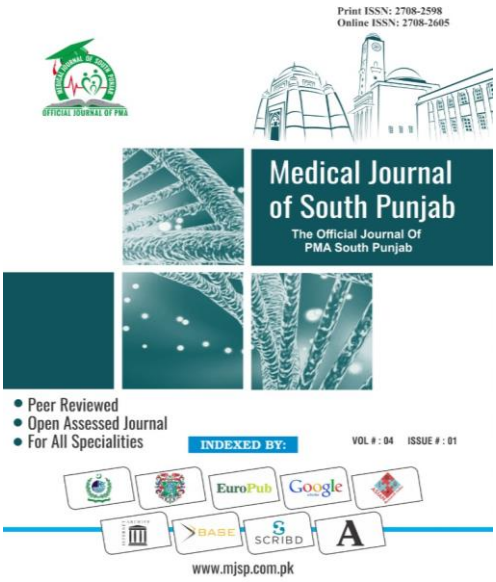

Efficacy of Silver Diamine Fluoride: An effective approach for reducing hyper sensitivity in restorative dentistry

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Original Article

Efficacy of Silver Diamine Fluoride: An effective approach for reducing hyper sensitivity in restorative dentistry

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ABSTRACT

Objective: *This study aimed to investigate the efficacy of 38% Silver Diamine Fluoride (SDF) in reducing Dentinal Hypersensitivity.*

Methods: *The study involved a randomized controlled trial of 90 patients having non-carious cervical lesions or root caries, and reporting hypersensitivity in the affected tooth. Participants were arbitrarily assigned to 2 groups: Group A received 38% SDF treatment, while Group B received 5% Sodium Fluoride NaF varnish. The primary outcome was evaluated by a dental consultant using a compressed air blast to assess dentin hypersensitivity. The data were collected at baseline, immediately after the intervention, and during a follow-up after one month.*

Results: *The results indicated that SDF demonstrated superior efficacy in reducing post-operative sensitivity compared to the NaF varnish group. The effects of SDF were longer-lasting, making it a potential treatment option for dentine hypersensitivity.*

Conclusion: *This study shows that 38% SDF has better efficacy in reducing post-operative sensitivity compared to the NaF varnish group. The effects of SDF were long-lasting, making it a viable treatment for dentine hypersensitivity. This study contributes to the growing interest in SDF usage for various dental applications and emphasizes its potential benefits in managing hyper sensitivity in restorative dentistry. Despite its limitations, such as limited follow-up duration and patient compliance, the research provides valuable insights for dental professionals to clinical decision by evidence based dentistry.*

Keywords: *Restorative dentistry, Silver diamine fluoride, Sodium Flouride Varnish , Dentistry, Dentine Hypersensitivity.*

1. INTRODUCTION

Silver diamine fluoride, SDF is a clear, odorless liquid indicated for de-sensitization of non-carious tooth lesions [1]. It is universally available as a 38% solution which contains silver ions and fluoride ions. Silver has antimicrobial properties that inhibits cariogenic biofilm on the dentine and Fluoride ions increase re-mineralization and decrease the de-mineralization of teeth. SDF also inhibits dentine collagen degradation [2]. The FDA has approved SDF as a dentine desensitizing agent. When SDF is applied to Hyper-sensitive dentin, it creates layer of conjugated form of silver and dentin organic matrix proteins, which partially seal the exposed dentin tubules [3]. A mild stimulus, which can be hot, cold, electrical, mechanical, or chemical can cause Dentine hypersensitivity, which is characterized by sharp transient pain [4]. Several dentine desensitizing agents are available, such as Sodium fluoride varnish NaF, Potassium Nitrate and Silver Diamine fluoride SDF. Nonetheless, there is a lack of conclusive data regarding the clinical effectiveness of professionally administered desensitizing agents to alleviate dentin hypersensitivity [5]. The SDF application leads to the development of a hyper mineralized layer, resulting in a decrease of dentinal sensitivity. The worth of silver diamine fluoride SDF has significantly risen during the COVID-19 pandemic because of its minimal invasiveness and non-aerosolizing approach [6]. SDF was routinely used in a pediatric dentistry, during the pandemic period when minimal aerosol production was considered as necessary [7].

Currently, SDF is classified as a desensitizing agent in the UK, and it can also be considered as an effective alternative non-invasive treatment [8]. Based on the results of biblio-metric analysis, interest in SDF treatment has rapidly increased in recent years [9]. Dentinal hypersensitivity resulting from demineralization or dental caries can be effectively treated with SDF, whereas dentinal hypersensitivity resulting from the exposed dentinal tubules may find more suitable treatment with NaF varnish [10]. Both 5% NaF varnish and 38% SDF have the ability to re-mineralize early enamel lesions, but it appears that SDF exhibits superior efficacy. However, it's worth noting that SDF can lead to enamel discoloration, making it unsuitable for use in esthetic zones [11]. The contraindications for SDF are silver allergy, Gingivo-stomatitis, Ulcerative Gingivitis, pulpitis or peri-apical conditions. SDF has an unpleasant metallic taste, it causes gingival irritation or burning sensation in mouth, causes the tissue to turn white but usually heals within 1 day to 2 days. The disadvantages of SDF are staining of skin and oral tissues and its sensitivity to light, the solution must be stored in a dark container [12].

The rationale of this study is to investigate the effectiveness of SDF in reducing post-operative sensitivity following restorative dental procedures. The objective of this research would provide valuable insights into the efficacy of SDF as a treatment option to alleviate post-operative sensitivity in restorative dental procedures. It would help dental professionals make evidence-based decisions regarding the use of SDF for enhancing patient comfort and satisfaction after such treatments.

2. METHODOLOGY

Randomized controlled trial of 90 patients. The sample size is calculated by online software www.openepi.com. The confidence level is set at 95% and power set at 80%. Percent of Unexposed with Outcome is 82 and Percent of Exposed with Outcome is 45, using reference no.16. The ratio of unexposed to exposed, in a sample is 1.0. Therefore; the sample size n=31 is for each

group. Assuming a 40% of loss to follow-up n=45 patient were recruited for each group.

Participants meeting the inclusion are randomly allocated into two study groups: Group A- 38% SDF and Group B- 5% NaF Sodium fluoride varnish. Randomization will be performed using a computer-generated random sequence. This study is single-blinded, with the participants being unaware of their assigned group. The Operator and outcome assessors will be aware of the group assignments. The participants in the Group A receive SDF treatment, according to the manufacturer's instructions. The teeth are isolated with cotton rolls and gently dried. SDF is applied with a disposable microbrush. Group B - Participants in the control group received 5% NaF sodium fluoride varnish applied by microbrush for 2 minutes minimum.

The primary outcome measure is evaluated by well-trained dental consultant, by using a air blast from a 3-in-1 triple-syringe, which is a simple and non-invasive method for evaluating dentine hypersensitivity.

The randomized controlled trial consists of total 90 patients, having root caries and Hypersensitivity. Teeth were randomly allocated into two groups. 45 patients were allocated to each group, In Group A (n = 45), 38% SDF and Potassium Iodide was applied and in Group B (n = 45), 5% NaF varnish was applied. Patient were recalled after 1 month and evaluated for postoperative sensitivity and caries arrest. Data is collected at baseline; immediately after the intervention and at follow-up appointments 1 month later. The assessment include clinical examinations by well experienced dentist and patient-reported outcomes.

The collected data is analyzed using SPSS-26 statistical tests, efficacy was determined for both of the groups and Chi-square test was used to analyze the data.

3. RESULTS

Sample size of 45 teeth for each groups were evaluated after 1 month for postoperative sensitivity. Out of 45 teeth in Group A, 13 were drop-out for follow-up and in group B, 11 were drop out after 1 month follow up. So the No. of teeth were Group A are 32 and group B 34 teeth. Post-operative sensitivity is reported in 6 teeth in group A and 16 patient in group B. (Table 1). The chi-square value is 5.9449. The p-value is .01476 taking significant level $p < .05$. The chi-square value with Yates correction is 4.7392. The p-value is .029483, taking significance level $p < 0.05$ (table 2).

Table 1.
Efficacy of SDF and NaF varnish in Hyper-sensitivity at Follow up.

Groups	Efficacy Yes	Efficacy NO	Total
Group A-SDF	26 (81.25)	6 (18.75)	32
Group B-NaF varnish	18 (52.94)	16 (47.05)	34

Table 2
Chi-square test. The P value is Significant at p < .05.

	SDF	**NAF**	***Marginal Row Totals***
Efficacy yes	26 (21.33) [1.02]	18 (22.67) [0.96]	44
Efficacy	6 (10.67) [2.04]	16 (11.33) [1.92]	22
Marginal Column Totals	32	34	66 (Grand Total)

4. DISCUSSION

In our study, the results showed the better efficacy of SDF solution over other control group, in terms of longevity. Studies have has shown that NaF varnish is effective in short term treatment of dentinal hypersensitivity 13. One study found that SDF was effective and safe in treating

dentine hypersensitivity with reductions in sensitivity persisting for 1 week after application. However, in another study, a SDF application in a preventive dentistry program did not have a significant preventive effect on root caries development in a group of older adult patients 14. The SDF solution is difficult to control over the application area, so 38% SDF experimental gel was studied in-vitro for its ability to penetrate and occlude dentine tubules. The SDF gel may become available as alternate intervention for the prevention of dentin hypersensitivity 15.

The Caries arresting property was found to be significantly higher in the SDF group compared to the NaF varnish group at 12-month intervals (SDF - 77% and NaF varnish - 42%) 16. However in another study, 12-month clinical trials found that a single application of 38% SDF was not superior to NaF varnish for caries prevention in primary teeth 17. A study demonstrated that SDF solution occluded the tubules on the dentine surface 18, demonstrating its desensitizing effect. However, there are limited well-designed clinical trials that investigate the efficacy of SDF in reducing dentine hypersensitivity in older adults 19, 20. In another study, application of 38% SDF solution on the exposed root surface of older adults, was found more effective than 5% Potassium Nitrate solution to reduce hypersensitivity 21.

The limitations of this study are the limited follow-up duration, participant compliance, and generalizability of the findings to broader populations. However, there is disparity in its use among the dental practitioners due to the disadvantage of permanent black discoloration. There are also concerns regarding its acceptance by the patients and/or parents. Dentists should be updated about SDF usage, as an alternate treatment to reduce post-operative hypersensitivity in teeth with cervical caries lesion.

5. CONCLUSION

This study shows that 38% SDF has better efficacy in reducing post-operative sensitivity compared to the NaF varnish group. The effects of SDF were long-lasting, making it a viable treatment for dentine hypersensitivity. This study contributes to the growing interest in SDF usage for various dental applications and emphasizes its potential benefits in managing hyper sensitivity in restorative dentistry. Despite its limitations, such as limited follow-up duration and patient compliance, the research provides valuable insights for dental professionals to clinical decision by evidence based dentistry.

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