

Efficacy of Different Fluoride Varnish Types in Pediatric Dentistry: Current Evidence: Review Article

Mohammed Allahyani*

General Dentist, Prince Mansour Military Hospital, KSA

***Corresponding Author:** Mohammed Allahyani, General Dentist, Prince Mansour Military Hospital, KSA.

Received: July 23, 2020; **Published:** August 29, 2020

Abstract

Fluoride varnish (FV) acts as a caries-inhibitory agent. The evidence from the available literature supports that if FV applied 2 - 4 times annually might effectively prevent dental caries in both primary and permanent dentitions. Moreover, the efficacy of FV is well supported by the literature in clinical practice guidelines worldwide; however, the implementation of FV in routine practice is still a debatable issue. The objective of this review was to compare the different types of Fluoride varnish in caries management of primary dentitions. FV should be applied in routine clinical practice. Novel FV with different composition has been introduced. Moreover, further prospective clinical trials are required to improve the quality of incidence.

Keywords: *Fluoride Varnish; Topical Fluoride; Primary Dentitions; Fluoride Applications; Fluoride Use*

Introduction

Fluoride varnish (FV) acts as a caries-inhibitory agent. The evidence from the available literature supports that if FV applied 2 - 4 times annually might effectively prevent dental caries in both primary and permanent dentitions. Moreover, the efficacy of FV is well supported by the literature in clinical practice guidelines worldwide; however, the implementation of FV in routine practice is still a debatable issue. The barriers that prevent the use of FV in clinical settings include insufficient time to integrate oral health services in practice, difficulty in applying FV and resistance among the staff. Therefore, clinicians must educate their patients and perform FV procedures effectively [1]. Fluoride promotes remineralization of the early caries lesions and reduces the tooth enamel solubility. Thus, FV releases fluoride to the enamel surface and to subsurface carious lesions that lead to the formation of calcium fluoride deposits and provides a fluoride ions reservoir. The highest release of Fluoride occurs during the first three weeks after the application with gradual release afterward [2].

Fluoride varnish might be considered an efficient, non-surgical alternative treatment for reversing active pit-and-fissure enamel lesions in the primary dentitions [3,4]. Several studies support the use of fluoride varnish to prevent early childhood caries and reduce caries incidence in very young children. Fluoride varnish application at the first dental visit will help reduce the caries increments at a later age [5].

Objective of the Study

The objective of this review was to compare the different types of Fluoride varnish in caries management of primary dentitions.

Overview

Recently, a variety of dental varnishes including several calcium and phosphate compounds in addition to fluoride has been introduced in the dental market. Moreover, fluoride varnish along with the calcium and phosphate contents release fluoride over a short period. A

3-month study by Rirattanapong P, *et al.* was conducted to evaluate the release of fluoride from different calcium phosphate-containing fluoride varnishes on primary dentitions. 5% sodium fluoride plus tricalcium phosphate (5% TCP) varnish had the highest initial fluoride release while 5% sodium fluoride varnish had the lowest fluoride release within the first 24 hours compared to other treatment modalities. Moreover, 5% sodium fluoride (5% NaF) varnish showed a slower rate of decline in fluoride release over time in relevance to other treatment groups. At 3 months evaluation, 5% NaF and 5% NaF+TCP had the highest fluoride release [6].

A study discussed the effectiveness of fluoridated varnish and silver diamine fluoride (SDF) in preventing the demineralization of primary anterior dentitions. No significant difference was observed between SDF and fluoride groups [7]. However, oral hygiene compliance in combination with four fluoride varnish applications or casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) during the 12 months reduced the size of White spot lesions in the anterior primary dentitions [8].

The effectiveness of sealants and fluoride varnishes for preventing caries lesions in relevance to no intervention has been discussed in the literature. Although a study was conducted to evaluate the relative effectiveness of fissure sealants with fluoride varnishes for preventing dental caries in the occlusal surfaces of permanent dentitions of children and adolescents. Authors concluded that low-quality evidence revealed the superiority of resin-based fissure sealants over fluoride varnish applications for preventing occlusal caries in permanent molars. Currently, it is not possible to draw a shred of conclusive evidence about the effectiveness of fluoride varnish versus sealants use [9].

On the other hand, a split-mouth study aimed to evaluate the effectiveness of resin-infiltrated lesions treated with fluoride varnish versus FV application on the proximal caries lesions of deciduous dentitions. Thus, results revealed the clinical and radiographic therapeutic effect of both resin infiltration with FV versus FV alone was > 35% and significant. In conclusion, this study supported that the combined approach of using resin infiltration with FV seems promising for controlling proximal lesion progression on the deciduous dentitions [10].

Each anti-caries product has its shortcomings. A recent study was aimed to determine the remineralization ability of Sodium Fluoride varnish (NaF), nano-hydroxyapatite serum (n-HAP) AND Nano Silver Fluoride (NSF) on the enamel of primary anterior dentitions. Results revealed that NSF had the greatest remineralization efficacy than NaF varnish and n-HAP serum was similar in remineralizing initial caries. Further prospective clinical trials are required for selecting the most relevant remineralizing agent in Primary dentitions [11].

Novel approaches

Currently, with the advancement in science and technology, novel chitosan added fluoride varnish that demonstrated a sustained Fluoride release in artificial saliva. The authors concluded that fluoride varnish with specific formulations containing 40 µL/mL chitosan is a potential material for sustained release fluoride varnish. However, further prospective clinical trials will be required to compare the novel varnish formulation with a conventional fluoride varnish [12].

Fluoride varnish consists of Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) showed a higher reduction in *S. mutans* count in biofilm samples followed by xylitol-containing fluoride varnish and Fluor Protector®. However, there was no effect of oral prophylaxis on the efficacy of fluoride varnish [13].

A study was conducted by Sleibi A, *et al.* to evaluate the ion release characteristics of three different dental varnishes consist of CPP-ACP, fluoride and bioactive glass. Hence, CPP-ACP and bioactive glass enhanced ion release without compromising the bioavailability of fluoride. The CPP-ACPF varnish had the most promising ion release [14].

Moreover, an *in vitro* study consisted of 45 sound human third molars was prepared as a specimen to evaluate the effectiveness of the remineralization potential of Nanosilver fluoride (NSF) formulation versus silver diamine fluoride (SDF) and sodium fluoride varnish

(NaF). Results revealed that NSF was not found as effective as SDF. However, additional investigation is required to improve the quality of evidence [15].

Recently, a study by Jain A., *et al.* have demonstrated the effectiveness of using two fluoride varnishes containing additives. Hence, Fluoride varnishes with or without additives are effective in the remineralization of early enamel lesions. Moreover, glass ionomer-based fluoride varnish results in better remineralization than xylitol coated calcium phosphate-containing fluoride varnish and 5% sodium fluoride varnish respectively [16].

A recent study by Santos was conducted to evaluate the effect of titanium tetrafluoride (TiF₄) varnish on the development of dentin carious lesions. It was found that TiF₄ had a better effect in reducing the mineral loss and carious lesion depth than NaF. Therefore, TiF₄ varnish has the best protective effect dentin carious lesion using a microcosm biofilm model [17].

Biannual professional application of fluoride varnish appears to be a highly cost-effective strategy [18,19]. The application of fluoride varnish four times a year prevented the incidence and reduced the severity of caries in pre-school children [20,21]. Enamelast and Duraphat varnishes promoted enamel surface remineralization, but no varnish remineralized the subsurface carious lesion body [22].

Conclusion

FV should be applied in routine clinical practice. Novel FV with different composition has been introduced. Moreover, further prospective clinical trials are required to improve the quality of incidence.

Conflict of Interests

The author declares no conflict of interest.

Bibliography

1. Bonetti D and Clarkson JE. "Fluoride Varnish for Caries Prevention: Efficacy and Implementation". *Caries Research* 50.1 (2016): 45-49.
2. Marinho VC., *et al.* "Fluoride varnishes for preventing dental caries in children and adolescents". *The Cochrane Database of Systematic Reviews* 11.7 (2013): CD002279.
3. Autio-Gold JT and Courts F. "Assessing the effect of fluoride varnish on early enamel carious lesions in the primary dentition". *Journal of the American Dental Association* 132.9 (2001): 1247-1253.
4. Yang G., *et al.* "Evaluation of the clinical effect of fluoride varnish in preventing caries of primary teeth". *Hua Xi Kou Qiang Yi Xue Za Zhi* 26.2 (2008): 159-161.
5. JA Weintraub., *et al.* "Fluoride varnish efficacy in preventing early childhood caries". *Journal of Dental Research* 85.2 (2006): 172-176.
6. Rirattanapong P., *et al.* "A 3-month study of fluoride release from different calcium phosphate fluoride varnishes on primary teeth". *The Southeast Asian Journal of Tropical Medicine and Public Health* 47.5 (2016): 1098-1104.
7. Mohammadi N and Farahmand Far MH. "Effect of fluoridated varnish and silver diamine fluoride on enamel demineralization resistance in primary dentition". *Journal of Indian Society of Pedodontics and Preventive Dentistry* 36.3 (2018): 257-261.
8. Memarpour M., *et al.* "Efficacy of fluoride varnish and casein phosphopeptide-amorphous calcium phosphate for remineralization of primary teeth: a randomized clinical trial". *Medical Principles and Practice* 24.3 (2015): 231-237.
9. Ahovuo-Saloranta A., *et al.* "Pit and fissure sealants versus fluoride varnishes for preventing dental decay in the permanent teeth of children and adolescents". *Cochrane Database of Systematic Reviews* 1 (2016): CD003067.

10. Ekstrand KR, *et al.* "Treatment of Proximal Superficial Caries Lesions on Primary Molar Teeth with Resin Infiltration and Fluoride Varnish versus Fluoride Varnish Only: Efficacy after 1 Year". *Caries Research* 44 (2010): 41-46.
11. Nozari A, *et al.* "Impact of Nano Hydroxyapatite, Nano Silver Fluoride and Sodium Fluoride Varnish on Primary Teeth Enamel Remineralization: An *In vitro* Study". *Journal of Clinical and Diagnostic Research* 9 (2017): ZC97-ZC100.
12. Pichaiakrit W, *et al.* "Fluoride varnish containing chitosan demonstrated sustained fluoride release". *Dental Materials Journal* 38.6 (2019):1036-1042.
13. Yadav S, *et al.* "Effect of three different compositions of topical fluoride varnishes with and without prior oral prophylaxis on *Streptococcus mutans* count in biofilm samples of children aged 2-8 years: A randomized controlled trial". *Journal of Indian Society of Pedodontics and Preventive Dentistry* 37.3 (2019): 286-291.
14. Sleibi A, *et al.* "A comparative evaluation of ion release characteristics of three different dental varnishes containing fluoride either with CPP-ACP or bioactive glass". *Dental Materials* (2019): S0109-5641.
15. Akyildiz M and Sönmez IS. "Comparison of Remineralising Potential of Nano Silver Fluoride, Silver Diamine Fluoride and Sodium Fluoride Varnish on Artificial Caries: An *In Vitro* Study". *Oral Health and Preventive Dentistry* 17.5 (2019): 469-477.
16. Jain A, *et al.* "Remineralising Effectiveness of Two Fluoride Varnishes Containing Additives: An *In Vitro* Study". *Oral Health and Preventive Dentistry* 17.4 (2019): 385-393.
17. Dos Santos DMS, *et al.* "Protective Effect of 4% Titanium Tetrafluoride Varnish on Dentin Demineralization Using a Microcosm Biofilm Model". *Caries Research* 53.5 (2019): 576-583.
18. Nguyen TM, *et al.* "A Markov cost-effective analysis of biannual fluoride varnish for preventing dental caries in permanent teeth over a 70-year time horizon". *Health Promotion Journal of Australia* 31.2 (2019): 177-183.
19. De Sousa FSO, *et al.* "Fluoride Varnish and Dental Caries in Preschoolers: A Systematic Review and Meta-Analysis". *Caries Research* 53.5 (2019): 502-513.
20. Sathyanarayan Sudhanthar, *et al.* "Improving oral health through dental fluoride varnish application in a primary care paediatric practice". *BMJ Open Quality* 8.2 (2019): e000589.
21. Su HR, *et al.* "The effect of fluoride varnish Duraphat in preventing deciduous dental caries in preschool children". *Shanghai Kou Qiang Yi Xue* 28.1 (2019): 48-52.
22. Godoi FA, *et al.* "Remineralizing effect of commercial fluoride varnishes on artificial enamel lesions". *Brazilian Oral Research* 33 (2019): e044.

Volume 19 Issue 9 September 2020

©All rights reserved by Mohammed Allahyani.