

Therapeutic Application of Fluoride Varnish

M. Indumathy, Hamrith Hari

Department of Public Health and Dentistry, Balaji Dental College and Hospital, Chennai, Tamil Nadu, India

Abstract

Fluoride is the safest, economical, and effective tool for the prevention of dental caries. Food and Drug Administration has listed fluoride as an essential nutrient for human health. The World Health Organization (WHO) expert committee has included fluoride in its list of 14 trace elements that are essential for normal growth and development. Approximately half the population of the USA is consuming optimally fluoridated water since 1980 and countries like the UK, New Zealand, and Australia are protected by water fluoridation. In India, the preventive measures are not so effective and the caries incidence is still on the rise. The average DMFT in India by the age of 15 years is about 3. This high incidence could also be attributed to a low dentist–population ratio of 1:80,000 in India. According to WHO, the DMFT of 2 by the age of 15 should cause alarm. The answer for this health problem is prevention. Although many measures are available, the best option is to use systemic and topical fluorides. Approximately 5% of the population lives in endemic fluoride areas and 3% lives in optimal fluoride areas. About 85%–90% of the population lives in fluoride deficient areas and preventive measures should be directed toward this segment of the population. The use of fluoride in communal water supply and dentifrices does not interfere with normal oral hygiene measures. Fluorides in dentifrices had led to the decrease in the incidence of dental caries in the US, UK and Scandinavia.

Keywords: Dental caries, fluoride varnish, remineralization

INTRODUCTION

Tooth decay is one of the most common microbiological infectious diseases worldwide. The World Health Organization estimated that 60%–90% of all children of school age have experienced dental caries.^[1] Dental caries is a multifactorial disease affecting both children and adults that leads to demineralization of the tooth structure. The main causative factors include the presence of endogenous cariogenic bacteria, frequent consumption of fermentable carbohydrates, and a susceptible tooth and host.^[2]

Although dental caries can progress if left untreated, it can be prevented, reversed, or arrested at its initial stages.^[3] Prevention and minimal intervention treatment following early detection of the lesion are becoming the new philosophy for managing dental caries. The antibacterial agent chlorhexidine has shown a preventive effect against dental caries. In addition, diet and fluoride have been shown to contribute to the arrest and prevention of dental caries.^[4]

The enamel of the tooth is exposed to various demineralization–remineralization cycles throughout the day. The balance between remineralization processes and demineralization

processes regulates whether dental caries remains static, progress, or are reversed.^[5] Biomineralization is a complex dynamic process that occurs throughout life. Demineralization of teeth is caused by acids from foods and drinks and microbial attacks of bacteria.^[6] These acids lead to plaque pH reduction and subsequent chemical dissolution of both the organic and inorganic matrix and mineral loss of the enamel. The phosphate ions and calcium ions disperse into the oral cavity, resulting in enamel demineralization.

However, this can be reversed and arrested if the lesion is detected before cavitation and if the number of cariogenic bacteria is reduced. During demineralization, calcium ions and phosphate ions move from the tooth to the saliva and the opposite occurs during remineralization. Phosphate and calcium ions diffuse into the enamel surface and form fluorapatite. Fluorapatite can resist demineralization and further enhance

Address for correspondence: Dr. M. Indumathy,
Department of Public Health Dentistry, Balaji Dental College and Hospital,
Pallikaranai, Chennai, Tamil Nadu, India.
E-mail: indupandiyani1995@gmail.com

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remineralization.^[7] Furthermore, remineralization agents such as synthetic hydroxyapatite can inhibit demineralization and enhance remineralization. Hydroxyapatite can occlude dentin tubules and attach to tooth surfaces, thus enhancing remineralization.^[8]

Several factors can affect this cycle, including patient education, reducing the rate of free sugar intake, controlling plaque formation, improving the buffering capacity of saliva, enhancing the salivary flow rate, and using additional caries preventive measures such as antibacterial agents and fluoride.^[9] Many fluoride systems that supply the tooth surfaces with fluoride are used in dentistry. Fluoride is available in two forms: A systemic form and a topical form.^[10] Topical fluoride systems are available for use at home with a low concentration of fluoride or professionally with a high concentration of fluoride.

SYSTEMIC FLUORIDE

Systemic fluoride is available via water fluoridation or can be taken in through the diet or fluoride supplements. Ever since the establishment of water fluoridation seven decades ago, fluoride has been at the center of caries preventive approaches.^[11] The systemic form of fluorides is the form that can be ingested. Systemically ingested fluoride integrates with the tooth elements and structure during the formation of the teeth before their eruption. It can change hydroxyapatite into fluorapatite, thus making the teeth more resistant to caries.^[12]

Topical home fluoride is available as mouth rinses, gels, and dentifrices (tubes of toothpaste). High-concentration professionally applied fluoride is available in the dental office as gels, foam, and varnish. Frequent exposure to a low concentration of topical fluoride is associated with caries reduction.^[13]

Topical fluorides can be used to enhance remineralization. Topical fluorides increase the availability of fluoride ions in saliva and enhance the formation of fluorapatite. Fluorapatite is strongly resistant to acid attacks and demineralization. In addition, increasing the concentration of fluoride may inhibit bacterial metabolism.^[14]

Varnish is a professional topically applied fluoride system. Varnish has been used extensively as a caries prevention strategy for over 3 decades. Topical varnishes slow down the release of active substances such as chlorhexidine, oxidative agents from bleaching systems, and fluoride. Fluoride varnishes (FVs) are professionally applied fluoride treatments that are usually applied 2 or 4 times/year depending on an individualized caries risk assessment of a child. This varnish can stick to the tooth surfaces for a relatively long time, thus releasing fluoride efficiently and effectively.^[15]

TOPICAL FLUORIDES

Topical fluoride use for children up to age 3 years ordinarily consists of conscientious use of a moderate amount of fluoride-containing toothpaste applied by a parent or caregiver.

Children whose teeth contain structural defects or who exhibit decalcified areas or other indicators that place them at moderate or high risk for developing caries, or toddlers who have previously experienced caries (i.e., early childhood caries), may receive additional topical applications in the form of professionally administered (e.g., fluoride varnish) or parentally applied concentrated preparations. Regardless of whether toothpaste or a more concentrated form of fluoride is applied, care should be taken to minimize the amount that is ingested. For the child who is either unable or unwilling to expectorate, either nonfluoridated toothpaste or only a smear of fluoridated toothpaste should be applied to the toothbrush. A parent or guardian should always be directly involved in the brushing process, as children in this age group have not yet developed the manual dexterity to adequately remove plaque from all surfaces of their teeth.

FLUORIDE VARNISH

Fluoride varnish was first introduced in Europe in 1964. More than 48 years of clinical studies have since demonstrated that fluoride varnish is a safe and highly effective means of preventing decay. Based on these studies, the American Dental Association rates the quality of evidence as “high” for the efficiency of fluoride varnish to prevent and control dental caries in both primary and permanent teeth.^[16] Although the preventive effects are strongest in infants, toddlers, and preschool children before caries has been detected, studies have shown that even for those children with a high risk of developing caries in the primary dentition, fluoride varnish is effective in reducing rates of decay.^[17]

Fluoride varnish first became available in the United States in 1991, when the US Food and Drug Administration approved its use as a cavity varnish. Today, there are a multitude of fluoride varnish products available to dental professionals. Although approved for use as a cavity varnish and for the management of hypersensitivity, the most common use of fluoride varnish is in the prevention of tooth decay. The therapeutic use of fluoride varnish for caries prevention in the United States is termed “off-label” use. This concept is sometimes confusing to those who may misinterpret it to mean that it is either illegal or unethical to use a product for an unapproved (as opposed to disapproved) use. However, the Federal Food, Drug, and Cosmetic Act does not limit the manner in which dentists may use approved drugs. It is often considered accepted medical or dental practice to use drugs for purposes other than that for which the drug originally received approval.^[18]

Fluoride varnish is considered by many to be ideally suited for application to the teeth of pediatric dental patients. Its ease of application makes it attractive for use with young or preoperative patients needing topical fluoride treatments. Most FVs consist of 5% sodium fluoride (2.26% fluoride ion) and are therefore more concentrated than most other professionally applied fluoride products. They are often sweetened with xylitol and contain a variety of flavoring agents,

which has improved their acceptance among the pediatric population over that of earlier formulations. In addition, many of the varnishes available today are tooth-colored as opposed to the caramel color of the original products. When used clinically, only a small amount is needed. Less than 0.5 mL of varnish is typically required to coat the teeth of a young child. Other potential uses for fluoride varnish include application to identify areas of high risk, such as decalcified areas, deep pits, and fissures that cannot be sealed, and around orthodontic appliances in patients with poor oral hygiene.

CONCLUSION

Fluoride varnish is easy to apply by disposable brush. Varnish application may be preceded by professional prophylaxis but may also be applied after brushing with a toothbrush. The teeth should be dried before application with either compressed air or dry gauze. Fluoride varnish can be applied to all tooth surfaces or may be selectively applied to sites at higher risk for caries (i.e., decalcified sites or maxillary anterior teeth in children at risk for early childhood caries). It is not necessary to wait for the varnish to dry before releasing the patient because the varnish sets upon contact with the oral fluids. After varnish application, eating and drinking should be delayed for at least 30 min. Toothbrushing is not recommended until the following day so that the varnish will remain in contact with the teeth for as long as possible.

Fluoride varnish can be applied 1 to 4 times a year. Although one yearly application has been shown to have some benefit,^[16] the American Dental Association recommends at least 2 applications a year, or every 6 months. Applications at 3-month intervals are recommended for those at high risk for caries.^[17]

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. World Health Organization, Others. Global Data on Dental Caries Prevalence (DMFT) in Children Aged 12 Years. Global Oral Data Bank. Oral Health Country/Area Profile Programme, Management of Noncommunicable Diseases. Geneva: World Health Organization; 2000.
2. Thylstrup A, Fejerskov O. Textbook of Clinical Cariology. Munksgaard; 1996.
3. Gugrani N, Gugrani S. Remineralisation and arresting caries in children with topical fluorides. *Evid Based Dent* 2017;18:41-2.
4. Sharma G, Puranik MP, Sowmya KR. Approaches to arresting dental caries: An update. *J Clin Diagn Res* 2015;9:ZE08-11.
5. Ismail AI. Visual and visuo-tactile detection of dental caries. *J Dent Res* 2004;83:C56-66.
6. Hicks J, Garcia-Godoy F, Flaitz C. Biological factors in dental caries: Role of saliva and dental plaque in the dynamic process of demineralization and remineralization (Part 1). *J Clin Pediatr Dent* 2003;28:47-52.
7. Featherstone JD. The continuum of dental caries-evidence for a dynamic disease process. *J Dent Res* 2004;83:C39-42.
8. Pałka LR, Rybak Z, Kuropka P, Szymonowicz MK, Kiryk J, Marycz K, et al. *In vitro* SEM analysis of desensitizing agents and experimental hydroxyapatite-based composition effectiveness in occluding dentin tubules. *Adv Clin Exp Med* 2020;29:1283-97.
9. Rosin-Grget K, Lincir I. Current concept on the anticaries fluoride mechanism of the action. *Coll Antropol* 2001;25:703-12.
10. American Dental Association. Fluoridation Facts. American Dental Association; 2018. p. 114. Available from: https://play.google.com/store/books/details?id=_p1qDwAAQBAJ.
11. Marinho VC, Worthington HV, Walsh T, Chong LY. Fluoride gels for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev* 2015;CD002280.
12. Harris NO, Garcia-Godoy F, Nathe CN. Primary Preventive Dentistry: Pearson New International Edition. Pearson Education Limited; 2014. p. 548. Available from: <https://play.google.com/store/books/details?id=-QoUnWEACAAJ>.
13. Recommendations for using fluoride to prevent and control dental caries in the United States. Centers for Disease Control and Prevention. *MMWR Recomm Rep* 2001;50:1-42.
14. Saunders JG, McIntyre JM. The ability of 1.23% acidulated phosphate fluoride gel to inhibit simulated endogenous erosion in tooth roots. *Aust Dent J* 2005;50:263-6.
15. Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States. *PsycEXTRA Dataset*. American Psychological Association (APA); 2001. Available from: <http://doi.apa.org/get-pe-doi.cfm?http://doi=10.1037/e548212006-001>.
16. Weintraub JA, Ramos-Gomez F, Jue B, Shain S, Hoover CI, Featherstone JD, et al. Fluoride varnish efficacy in preventing early childhood caries. *J Dent Res* 2006;85:172-6.
17. American Dental Association Council on Scientific Affairs. Professionally applied topical fluoride: Evidence-based clinical recommendations. *J Dent Educ* 2007;71:393-402. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/17389574>.
18. Torres A. The use of Food and Drug Administration-approved medications for unlabeled (off-label) uses. The legal and ethical implications. *Arch Dermatol* 1994;130:32-6. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/8285737>.