

Fluoride Varnish: A Useful Dental Public Health Tool

C Marya, V Dahiya

Citation

C Marya, V Dahiya. *Fluoride Varnish: A Useful Dental Public Health Tool*. The Internet Journal of Dental Science. 2006 Volume 4 Number 2.

Abstract

Health professionals have a new opportunity to help prevent tooth decay in young children and root caries in older people. Fluoride varnish is relatively inexpensive, easy to paint, concentrated topical fluoride with a resin or synthetic base. It is efficacious in reducing caries in primary and permanent teeth. The indications, contraindications, efficacy, uses and mechanism of action are discussed.

INTRODUCTION

Fluoride varnish is a professionally applied adherent material which consists of high concentration of fluoride as a salt or silane preparation in fast drying, alcohol based solutions of natural varnishes. They are intended to be as permanent as fissure sealants. They are painted on to enamel or cementum. The purpose is to hold fluoride in closed contact with the tooth for a period of time. It permits the application of high fluoride concentrations in small amounts of material.

The prevention of caries in children is at the forefront of public health strategies [1]. Fluoride is a major player in the slowing, arrest and even reversal of dental caries progression. Ideally the most effective application method provides prolonged exposure of tooth surface to fluoride. Fluoride varnishes delivering concentrated amounts of fluoride to a defined area satisfies this important criteria.

TYPES

Fluoride varnishes were first developed in Europe in 1960. They were developed as a topical fluoride, which, like various pastes, solutions and gels could be administered in the dental office by dental professionals [2]. The first fluoride varnish tested was DURAPHAT. It contains 5% sodium fluoride in a neutral colophonium base or 2.26% fluoride. It is a viscous resinous lacquer which is applied to dry cleaned teeth. It hardens into a yellowish brown coating in the presence of saliva. Another varnish developed in the 1970s was FLUOR PROTECTOR which contains silane fluoride [0.7%] ion in a polyurethane based lacquer. It leaves a clear transparent film on the teeth. Another varnish CAREX which contained a lower fluoride concentration than

Duraphat [1.8% fluoride] was also tested. The efficacy of this new varnish as a caries preventive agent was found equivalent to that of Duraphat [3].

EFFICACY

Early clinical trials of fluoride varnish gave mixed results [4,5,6]. Reviews in the 1980s also concluded that the clinical efficacy of varnishes was equivocal [7,8]. Many studies examining fluoride varnishes efficacy in the permanent teeth in the school aged children have been published in the recent past [9,10]. Researchers believe that the efficacy of fluoride varnish differs for permanent and primary teeth. While the evidence for effectiveness of fluoride varnish in permanent teeth is established, evidence for its effectiveness in primary teeth is incomplete and inconsistent [11]. A clinical study in 2006 by Weintraub also confirmed fluoride varnish is efficacious in reducing early childhood caries incidence [12]. Clinical studies have demonstrated that varnishes can supply fluoride more efficiently than other topical agents [13]. Majority of studies show 25-45% caries reduction resulting from fluoride varnish use. Some studies demonstrated effects as high as 75% [14]. Promising results have also been reported for efficacy of fluoride varnish in preventing root caries in the elderly. Varnishes need to be reapplied at regular intervals to maintain their cariostatic effect [15]. Investigations of optimum application frequency found that applications 3 times a week, once per year was more effective than the conventional twice per year regimen [16].

MECHANISM OF ACTION

Fluoride varnish painted on to enamel or cementum hardens to a clear or slightly yellowish film. It acts by a slow release

of fluoride ion to the underlying tooth surface. The availability of fluoride in the liquid phase around the apatite crystallites blocks crystalline dissolution and reduces the rate of demineralization. Increased fluoride ion activity that results after fluoride varnish treatment in sound or carious enamel, actually enhances mineral deposition and promotes remineralisation. The greater fluoride concentrations attainable with varnishes produce deposits of calcium fluoride, depositing fluoride in porosities and microchannel at different cariogenic sites in the enamel. These fluoride reservoirs gradually release fluoride into dental plaque, saliva or apatite structure of the tooth when the pH drops [17].

INDICATION

Infants and children with moderate or high risk of developing caries.

A child is at risk if he/she has:

- Had cavities in the past or has white spot lesion and stained fissure
- Continues to use the bottle past one year of age or sleeps with the bottle containing liquid other than water
- Breast-feeds on demand at night
- Has a developmental disability
- Chronically uses high sugar oral medications

CONTRAINDICATIONS

Children with the low risk of caries who consume optimally fluoridated water or children who receive routine fluoride treatments through a dental office.

ADVANTAGES

- Varnish is available in different flavors
- They do not have bitter taste like APF gels and can be readily applied in children
- They are quick and easy to apply [usually 1 minute per patient as opposed to about 4 minutes for gels]
- Does not require the use of suction, air drying of teeth and use of trays that may trigger gag reflex.
- They are safe to use due to their fast setting and slow fluoride releasing properties [13]. The amount of fluoride ingested is small or negligible. Plasma

levels of fluoride barely changes after varnish application but can increase significantly after APF gel application.

- It can be applied in any setting and does not require the use of sophisticated dental equipments and instruments.
- Teeth do not need to be professionally cleaned prior to varnish application

SAFETY

Though sodium fluoride varnish has a higher concentration of fluoride than current gels, foams, rinses and pastes, but is less toxic to children because less of it is swallowed during application. Toxicity and nausea are a cause of concern with children. Studies have shown that fluoride in patient's blood plasma is lowest amongst fluoride varnish users than users of other topical treatments.

The use of fluoride varnish as a topical agent continues to grow at a fast pace. Based on ease of application, low ingestion of fluoride, superiority to other topical procedures, as well as a potential for the reduction of root caries in adults, the fluoride varnish is finding a place in both public health and private practice. Two main benefits like effectiveness in preventing the need for fillings and crowns as well as decreased risk of fluoride toxicity and fluorosis makes it a great public health measure against caries. It is proving to be a significant tool to address disease prevention in susceptible poor and low-income group children. The ease of application and fast setting property makes it the product of choice for handicapped children and old age patients. The improved economic benefits resulting from the use of fluoride varnish can have considerable implications for school and dental health programs. Fluoride varnish should be recommended as a part of caries prevention program targeting children specially in developing countries.

References

1. Vaikuntam J. Fluoride varnishes: should we be using them? *Pediatr Dent* 2000;22(6):513-16.
2. Stooky G. Critical evaluation of the composition and use of topical fluorides. *J Dent Res* 1990;69:805-12.
3. Haugejorden O, Nord A. Caries incidence after topical application of varnish containing different concentrations of sodium fluoride. 3 year results. *Scand J Dent Res* 1991;99:295-300.
4. Holm AK. Effect of fluoride varnish [Duraphat] in preschool children. *Community Dent Oral Epidemiol* 1979;7:241-45.
5. Koch G, Peterson LG, Ryden H. Effect of fluoride varnish [Duraphat] treatment every 6 months compared with weekly

mouth rinses with 0.2 percent sodium fluoride solution on dental caries. Swedish Dental Journal 1979;3:39-44.

6. Murray JJ, Winter GB, Hurst CP. Duraphat fluoride varnish: a 2 year clinical trial in 5 year old children. British Dent J 1977;143:11-17.

7. Clark DC. A review on fluoride varnishes: an alternative topical fluoride treatment. Community Dent Oral Epidemiol 1982;10:117-23.

8. Primosch RE. A report on the efficacy of fluoridated varnishes in dental caries prevention. Clinical Preventive Dentistry 1985;7:12-22.

9. Weintraub JA. Fluoride varnish for caries prevention. Comparison with other preventive agents and recommendations for a community based protocol. Spec Care Dentist 2003;23:180-86.

10. Bader JD, Shugars DA, Bonito AJ. Systemic reviews of selected dental caries diagnostic and management methods. J Dent Edu 2001;65:960-68.

11. NIH. Diagnosis and management of dental caries

throughout life. National Institute of Health Consensus Development Conference statement. J Dent Edu 2001;65:1162-68.

12. Weintraub JA et al. Fluoride varnish efficacy in preventing early childhood caries. J Dent Res 2006;85(2):172-76.

13. Peterson L. Fluoride mouth rinses and fluoride varnishes. Caries Res 1993Suppl;1:35-42.

14. Mandel I. Fluoride varnishes - a welcome addition. J Public Health Dent 1994;54(2):67.

15. de Bruyn H, Arends J. Fluoride varnishes - a review. Journal de Biologie Buccale 1987;15:71-82.

16. Petersson LG, Arthursson L, Ostberg C et al. Caries inhibiting effects of different modes of Duraphat varnish reapplication. A 3 year radiographic study. Caries Research 1991;25:70-73.

17. Rølla G, Ogaard B, Cruz RD. Topical application of fluorides on teeth. New concepts of mechanism of interaction. J Clin Periodontol 1993;20(2):105-8.

Author Information

C. M. Marya, BDS, MDS

Professor & Head, Department of Community Dentistry, National Dental College & Hospital

Vandana Dahiya, BDS

Dental Surgeon, Department of Community Dentistry, National Dental College & Hospital