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Comparing fluoride release in preventa and enamel pro in laboratory environment

Ramshid Tork-Zaban,[1]* Beheshteh Malek-Afzali,[2] Mahshid Tork Zaban[3] and Yasaman Rezvani[i4]

[1]*Dentist*
[2]*Associate Professor, Department of Pediatric Dentistry, Faculty of Dentistry, Shahid Beheshti University of Medical Sciences and Health Services, Tehran, Iran*
[3]*PhD in Medical Physiology*
[4]*Assistance Professor, Department of Pediatric Dentistry, Faculty of Dentistry, Shahid Beheshti University of Medical Sciences and Health Services, Tehran, Iran*

ABSTRACT

According to high prevalence of tooth decay in the world and Iran, and based on side effects and costs related to their treatment, study different methods for prevention of decay is on priority. The purpose of this study is comparing fluoride release in preventa and enamel pro in laboratory environment.+ In this experimental- laboratory study, 40 varnishes were used including 20 Iranian varnish and 20 outsider varnishes. Celluloid matrix strip was completely covered with under studied varnishes. Covered strips were placed in 25 ml deionized stilled water and washed were brought out at first, fourth, 24th and 72th hours of experiment and were washed with 5 ml deionized stilled water. Then strips were placed in new solution. Finally, fluoride release rate was measured by potentiometer and was reported by ppm. Data were analyzed by SPSS 20th version of software. Results indicated that fluoride release rate had significant changes during the time in enamel-pro and in preventa ($p < 0.001$ in two case) and in all times enamel-pro had highest release rate in 4,24, and 72 hours respectively ($P < 0.001$). In prevental group had highest release rate in 4, 24 and 72 hours respectively ($P < 0.001$). Enamel-pro varnish release significantly more fluoride in all mentioned hours rather than preventa.

KEY WORDS: FLUORIDE RELEASE, FLUORIDE VARNISH, ENAMEL PRO PREVENTA

INTRODUCTION

Tooth decay is a disease related to calcified tissue of tooth which is exposed by decalcified cation of mineral section of tooth and decomposition of organic section of tooth (Pinkham 1999). This disease is the most prevalent disease in people that had always been a problem in spite of all attempt to stop it (Harry's 1996). In last decade, prevalence of tooth decay has been considerably decreased in developed countries such as united states and other developed countries while this disease has remained as problematic as the past in developing countries.

Prevention has been identified as the best and most effective coping method with any diseases including tooth decay. While consumed cost of tooth decay prevention is much less than its treatment (Mehrdad 1992). Stated theories are different in this context however one of the main aims for plans of tooth decay prevention and its control is increasing resistance of tooth enamel surface against acidic products (Forrest 1981). The most important and effective way of achieving these goals is using fluoride. Vital role of fluoride in prevention of teeth decay has been recognized since last 50 years (Axelsson 2000). Fluoride in tooth plaque penetrates into enamel of new tooth consequently lead to calcification which reduces tooth talent for decaying. Tooth structure which is at the presence of remineralized fluoride including high density of fluorapatite hydroide which makes remineralized tissue more resistant than initial structure (Mehrdad 1992).

It is proven that repeated application of fluoride has considerable effect on controlling and prevention of tooth decay in children and adults (McDonald 2000) different methods exist for using fluoride including using fluoridation of drinking water, local fluorides of pills with fluoride, toothpaste and mouthwash and varnishes with fluoride (Finn 1995).

Usage of drinking water with 50-59% fluoride prevents tooth decay (Mehrdad 1992). According to lack of sufficient fluoride in drinking water in our society, there is need to provide fluoride from other resources including toothpaste, gels, and varnishes with fluoride. Based on theories, consistent use of fluoride through different forms causes creation of prophylaxis status against decay (Stewart 1982).

Treatments which are performed by varnish of fluoride gel have high effect in control and prevention of decay. In addition, previous studies indicated that using varnishes with fluoride have advantages over other methods. These advantages include instance, easy use, less risk in swallowing of forbidden value of fluoride, high collaboration of children in using it, lack of need to professional prophylaxis, cleaning tooth surface before using it, its hardening near saliva moisture. Thus, using varnishes is very favorable method for preventing tooth decay.

According to lack of studies in case of enamel pro and preventa varnishes we decided to perform a research aiming at comparing level of fluoride ion release in preventa and enamel pro varnishes during 2014-2015. We therefor made this research in research center of dentistry university of Shahid-Beheshti University.

MATERIALS AND METHODS

Method of sample preparation was as follow: 20 celluloid matrix strips by 40*20 mm dimensions were fully covered with each under studied varnishes, with similar brush, by an operator and with 8 reciprocating motion. Value of varnishes on these strips was measured in order to homogenization of all samples weight. In this way, weight of each strip was measured before and after covering by each varnished by digital scale (AL-104, Acculab, a machine for measuring material mass with 0/0001 g accuracy and measurable 100 g maximum mass (Figure 1). in fact, difference of these two status weight is equal to weight of applied varnish for covering strips.

Covered strips were placed in 25 ml deionized distilled water and incubated in 37 degree temperature and 95% humidity in cold incubator machine. at first, fourth, 24th and 72th of experiment, samples were extracted from the solution, and were washed by 5ml deionized stilled water. Then strips were placed in new solution. 5ml of 30 ml final solution were separated by gauged electric pipettes and mixed with 0/5 ml TIZAB (Total Ionic Strength Adjustment Buffer made by Merck German company).

In TIZAB mixture, 0/2 g/L CDTA with formula 1 and -2 trans diaminocyclohexane- N, N, N, N tetra Acetic Acid ($C_{14}H_2N_2O_8H_2O$) and 57 mg/lit glacial acetic acid (CH_2 COOH) and 85 g/L chloride Sodium (NaCl) were used and by adding sodium hydroxide (NaOH) 4 mular was set in -5/5 pH.

Then obtained solutions were assessed considering level of fluoride ion in Ion Analyzer (Crison, Instrument, S.A/ Spain).

Crison, Instrument, S.A/ Spain machined (figure 2) has two channel for measuring acidity (pH) and different ionic density which are used as follow:

> Chanel 1: it was used for acidity and has capacity of calibration containing 1,2,3 point with reference solutions. Measurement unit of this canal is pH and its accuracy is 0/01.

> Canal 2: it was used for measuring ionic density such as level of fluoride ion release with

potentiometer method and has capacity of 5 point calibration with 0/1, 0/01, 0/001, 0/0001, 0/00001 standards for measuring density of fluoride ion. Measuring unit of this canal is mol/litter and milligram/litter. In this study we used canal 2.

Average of fluoride release and standard deviation (SD) was calculated for all experimented cases in all times. For studying normality of data distribution, we used Shapiro-Wil. For assessing different materials and groups, variance analysis test with repetitive data and pairwise bonferoni test were applied. The level (p<0/05) was statistically significant.

RESULTS AND DISCUSSION

In this study, level of fluoride ion release was measured in two varnishes at first hour. But as level of released in preventa varnish was less than 1ppm, it is considered as zero and is not statistically valuable and it is not considered in analysis. Based on Shapiro-Wilk and investigation of theoretic distribution of data in different times all values are higher than 0/05 thus normality of data was accepted and parametric tests at the following were used for testing hypothesis.Pattern of decrease and increase in fluoride release level in different time is not the same in both materials. In each time both materials are compared and each arterial is investigated considering fluoride release level. Results of variance analysis of repeated measurements indicated that fluoride release level during the time had significant change either in enamel- pro or preventa (P<0.001 in both cases).Pairwise compare of times by Bonferroni illustrated that in enamel- pro group maximum release happened in fourth hour (P<0.001). 24th hour had significant more release than 72th hour (P<0.001) and less release than fourth hour (P<0.001).

In Preventa group, 72th hour has maximum release value and fourth hour had least release and this difference was significant (P<0.001). In Preventa group, 72th hour has most release value and 4th hour has least release value and this difference was significant (P<0.001). in
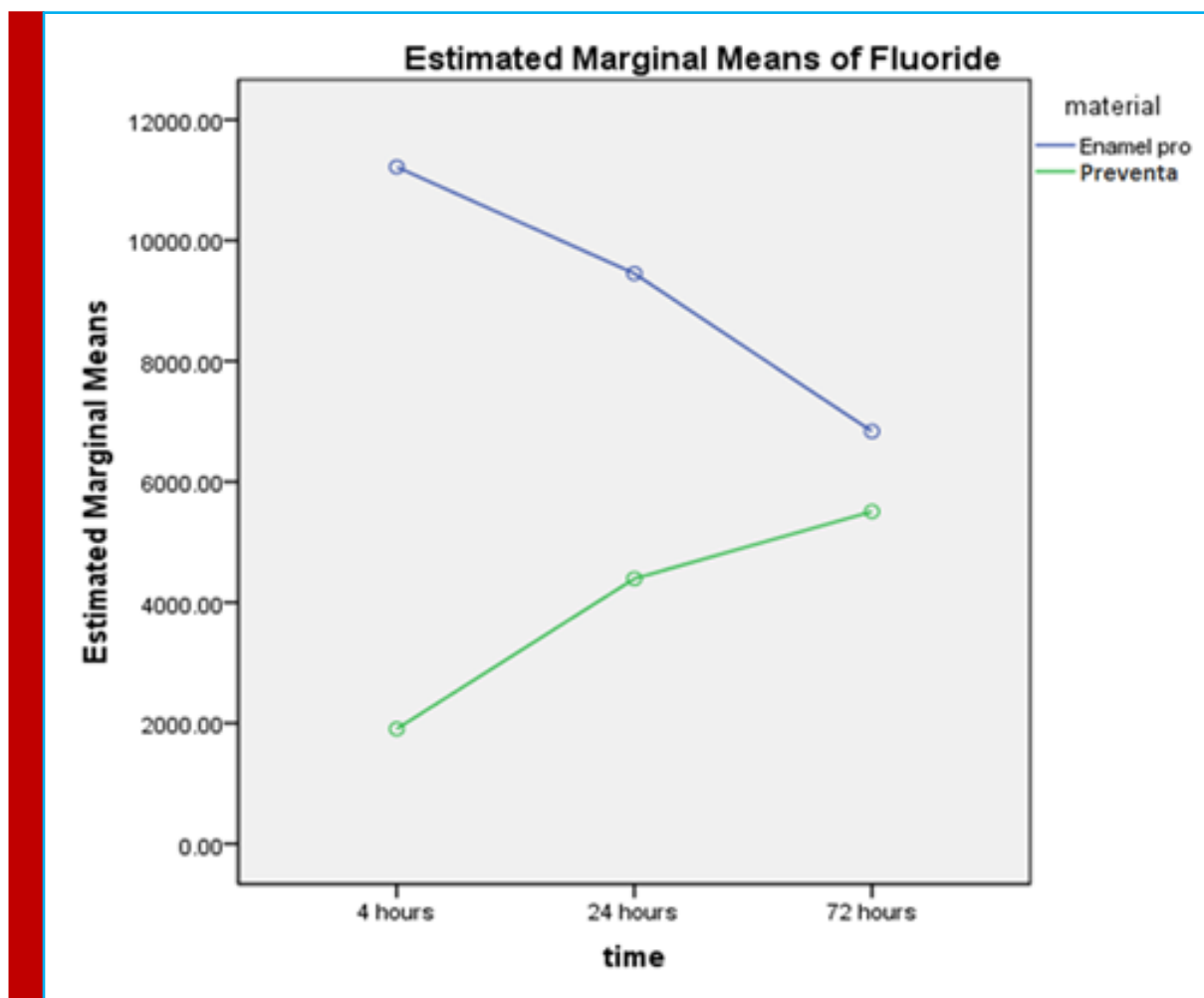
addition, 24th hour had highest release than 4th hour (P<0.001) and less release than 72th hour (P<0.001).Two sample t test (independent simples t-test) indicated that in all times enamel- pro had higher level of release than Preventa (P<0/001 in each 3 times).

Results of the study indicated that fluoride release level had significant change during the time either in enamel pro or in Preventa (P<0.001 in both cases) and in all times, enamel- pro had more fluoride release level than Preventa. Although in each study, both varnishes have the same density of fluoride but fluoride release level in different times indicated significant change between two varnish. Based on results of this study, in all times, enamel pro had more fluoride release level than Preventa. When fluoride release level is more, it can show more fluoride absorption by tooth enamel (Comar LP. Et al., 2014). Additionally, this difference can be due to difference in resin transporters or applied additives by producers which it may have effect on fluoride release. Another possibility is existence of ACP in enamel pro combination.

In addition, in this study, fluoride release has been observed in first hour of observation but in it was not observed in case of preventa varnish (less than 1 ppm). This finding was clinically very important because in first hour we had maximum varnish volume in child mouth. On the other hand, preventa varnish had increase of release in hours after 24th hour. According to Cochrane studies and his colleagues in 2014 it is illustrated that fluoride varnish has short lifespan in the mouth around 24 hours and it is washed due to tongue, cheek, saliva and tooth brushing (Cochrane NJ., 2014). So we can conclude that increase of fluoride release level is clinically not important after 24th hour in preventa varnish.

In Cochrane studies and his colleagues in 2014, calcium ion release, inorganic phosphate and fluoride was measured in MI, White varnishes and significant differences had been reported in fluoride release in first 24th hour in different varnishes (Cochrane NJ., 2014). However, in this study artificial suliva and human tooth was not used. Enamel Pro, Bifluorid 5, and Duraphat

In Jablonowski et al (2012) study fluoride ion released from fluoride of Enamel Pro, Duraphat and varnish XT fluoride varnishes was studied. Results indicated that in Enamel pro and varnish XT, fluoride release curvature was significantly different with Duraphat Vanish, and Enamel pro varnish in all time had highest level of fluoride release which was consistent with this study.

In Ritwik et al study (2012) fluoride level released from Premiere Enamel pro, Premiere, Colgate PreviDent, Omni Vanish, and Omni Vanish XT was compared in 48 years' period. Obtained results indicated that curvature

of fluoride release in each varnishes were significantly different. Premier Enamel pro showed highest level of fluoride release after using each varnishes in all hours of assessment which is compatible with our study.

In Bolis et al. (2015) fluoride absorption rate was compared with fluoride release level inside saliva. After 4 hours, highest absorption of fluoride by enamel in artificial saliva was respectively in Fluor Protector and Enamel Pro varnishes. Absorption of fluoride had no significant relation with fluoride release in artificial saliva. MI Varnish had highest level of fluoride release in first 4 hours (Ritwik 2012).in this study; enamel pro had highest level of fluoride release in 4th hour.

In Lipert (2014) study fluoride released from fluoride sodium varnishes was measured under acidic condition. Final result indicated that fluoride release in different varnishes dependent on decomposing factors had no significant difference. Enamel Pro and Nupro had highest level of fluoride release (Comar et al., 2014).

In Cochraneet al (2014) study fluoride release level was experimented in all products in experimental environment from first hour until reaching to 168th hour was increasing. However, in Ritwik et al study (2012) fluoride release level was experimented in all products from first hour until 48 hours was decreasing. Researchers reported that fastest fluoride release was related to first 7 hours and then in first week. This difference is due to varnish transporter in Peventa product because transporter has effect on fluoride release (Ritwik 2012).

In this study, fluoride release of enamel pro in 4th hour was the most and in 72th hour was the least and had decreasing trend but in Preventa this level was least in 4th hour and was most at 72th hour.As providers of oral hygine cares this is our responsibility to identify dentistry products and benefit patients. It is proved that products supporting prevention of decay need to be necessary part of total preventive treatment. Based on results of the experimental study, both assessed products are the best method for prevention of tooth decay however choosing need to be based on clinical signs of every patient.Here, the question is whether enamel pro which release more fluoride is better? Directly it seems that the more fluoride releases the more fluoride is available for tooth enamel absorption. However, this needs broad studies which specifically measures fluoride absorption by tooth after using fluoride varnish.

CONCLUSION

During the time, fluoride release has had significant change either in enamel pro or Preventa (P<0.001 in both cases). In all times, enamel- pro had more fluoride release than Preventa.

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