FLUORIDE ABSORBED ON EXTRACTED TEETH AFTER IMMERSING IN FLUORIDE TABLET, FLUOCOL SOLUTION AND FLUORIDE DENTRIFICE (IN VITRO TEST)

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ABSTRACT

Background: The role of fluoride in preventing tooth decay both for children and adult has been acknowledged internationally. There are several types of fluoride modalities either topically or systemic way. In Indonesia the modalities used to apply are fluoride tablet, fluocol solution and fluoride containing toothpaste. The purpose of this research is to find the effectiveness of fluoride modalities.
Method: The study design was quasy experimental with 40 extracted teeth (Premolar teeth). The teeth divided into four groups : group I soaked on tablet fluor, Group II ; soaked on fluocol solution, Group III soaked on fluoride tooth paste and group IV soaked on Mill Q (Aquadest/ Control solution). Fluoride concentration before and after soaking was determined using Spectrophotometer UV-Vis. Fluoride absorption was determined by the reduction of fluoride concentration after soaking.
Result: Research result shown that the highest fluoride absorption was on soaking in fluoride tablet, followed by soaking on fluocol and tooth paste (mean fluoride absorption was 0,32; 0,08 and 0,04 ppm). Anova test shown significance level was 0,000.
Conclusion: there were a significance of fluoride absorption on soaking in tablet fluoride, fluocol solution and toothpaste. The mechanism of fluoride regimens shown different fluoride absorption.

INTRODUCTION

Caries preventif effort in dentistry based on etiology concept. Theoritically, caries prevention can be apllied with modified between interaction etiology factors and improvement strengthen teeth resistance factor[1]. Fluoride role to reduce caries has been reported since 1930. Role of fluoride in preventing caries both for children and adult has been ackowledged internationally. Rugg-Gunn[2] reported fluoride was very effective towards dental caries.

Fluoride works optimally when low concentration applied and continuosly maintain in plaque and saliva [3]. Rolla dan Ekstrand found toothbrushing with fluoride toothpaste increase saliva fluoride concentration 100 – 1000 fold for at least 120 minutes. Toothbrushing with fluoride toothpaste proven as the most effective way to prevent caries.

Suwelo[4] stated when fluoride in water supply lower than 0.3 ppm, it is suggested to use fluoride topically or systemic. Fluoride concentration in Goverment Water Supply (PDAM) is lower than 0.3 ppm, therefore fluoride tablet for children is needed. Sunarjo[17] reported most Semarang dentists (61,7%) agree for fluoride prescription for children. Central Java Health of Department has applied fluoride tablet as mouth rinse for school children. Fluoride applied topically such as fluoride toothpaste; fluocol solution and fluoride mouthrinse are more optimal than fluoride applied systemic[5,6].

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Fluoride usage in appropriate dosage can minimize side absorption obtained on the use of fluoride toothpaste, fluoride tablets and application of fluoride solution to the teeth. Yamazaki, et al.[7] stated there is a relationship between the availability of fluoride in the preparation and effectiveness of fluoride in preventing tooth demineralization.

Efforts to determine fluoride availability in fluoride tablet dissolved, fluoride toothpaste and use fluocal solution is essential to avoid excessive fluoride intake or vice versa in order to obtain optimal fluoride therapeutic dose (0.07 ppm or 0.7 mg per day) to prevent caries.

RESEARCH METHOD

Research design was quasy experimental with extracted teeth as samples. Healthy and free caries extracted premolar permanent teeth which has been extracted for 1-2 months ago was used. Samples were kept in aquadest before has been manipulated. Fluoride tablets used is Vinafluor with a dose of 1 mg, Fluocol is fluoride solution with high concentration. The content of fluocol is Sodium Fluoride (NaF) at a concentration of 24 mg in 1 kg NaF solution, fluoride toothpaste was fluoride paste with a small dose of fluoride 1 mg in 1 kg, Mill Q (distilled water) is a sterile solution was used as control group.

Fluoride availabilty is fluoride concentration on extracted teeth in ppm (part per million) and measured with Spektrofotometer UV Visual.
Research steps were:

1. Twenty premolar teeth were prepared
2. The sample teeth were divided into 4 groups (each groups was 5 teeth)
3. Made solution for soaking teeth (inserted into the glass tube Conical)
   - Group I: 2 ml Mill Q plus 1 mg Vinafluor which has been crushed (pulverized)
   - Group II: 2 ml Mill Q added 3 drops of fluocol solution
   - Group III: 2 ml Mill Q plus 1 mg toothpaste
   - Group IV: 2 ml solution of Mill Q
4. Each group put on the Vortex solution for vortification to make it homogeneousFluoride concentration measurements using a spectrophotometer (ά 595 mm), the results were recorded in the table as the concentration of fluoride before immersion
   - Group I: Extracted teeth immersed in a solution of fluoride tablets
   - Group II: Extracted teeth immersed in fluocol solution
   - Group III: Extracted teeth immersed in a fluoride toothpaste solution
   - Group IV: Extracted teeth immersed in a solution of Mill Q
5. All group immersed in four different group solution then centrifuged for 5 minutes at 1,500 rpm
6. Fluoride concentration measured using a UV spectrophotometer with ά Visual 595 mm , the results recorded in the table as the fluoride concentration after immersion
7. Fluoride concentration absorbed to extracted teeth was assumed as a result of the concentration of fluoride before immersion minus fluoride concentration after immersion

Paired t test was used to determine the effect of immersion in the group (pre and post treatment) on the absorption of fluoride. ANOVA test was used to determine differences of fluoride availability in 4 (four) experimental and control groups. Post hoc tests need to be done to find the highest fluoride levels from all groups.

RESULT

Tabel 1. Fluoride concentration absorbed in a tablet fluoride solution

Fluoride concentration before immersing (ppm)	Fluoride concentration after immersing (ppm)	Fluoride absorbed (ppm)
2,52	2,22	0,13
2,50	2,1	0,4
2,55	2,15	0,4
2,50	2,20	0,3
2.40	2.15	0.35

Tabel 2. Fluoride concentration absorbed in fluocol solution

Fluoride concentration before immersing (ppm)	Fluoride concentration after immersing (ppm)	Fluoride absorbed (ppm)
0,2	0,14	0,06
0,18	0,1	0,08
0,22	0,14	0,08
0,24	0,18	0,06
0, 30	0,20	0,10

Tabel 3. Fluoride concentration absorbed in fluoride toothpaste solution

Fluoride concentration before immersing (ppm)	Fluoride concentration after immersing (ppm)	Fluoride absorbed (ppm)
2,62	2,6	0,02
2,66	2,6	0,06
2,6	2,59	0,01
2,62	2,58	0,04
2.70	2,62	0,08

Table 4. Mean fluoride concentration absorbed after immersing in fluoride tablet; fluocol and fluoride toothpaste solution

Group of treatment	Mean F aborbed (ppm)
Immersing in fluoride tablet solution	0,32
Immersing in Fluocol Solution	0,08
Immersing in fluoride toothpate solution	0,04

1. Fluoride concentration after immersing in tablet fluoride solution

Table 1 shown a decrease of fluoride concentration after immersing in fluoride tablet solution. It was assumed that fluoride absorbed in extracted teeth. Paired t test was 0,000 and concluded that there was a significance differences on fluoride concentration after immersing in fluoride tablet solution.

2. Fluoride concentration after immersing on fluocol solution

Table 2 shown a fluoride decrease before and after immersing in fluocol solution. It was proven there was fluoride absorbed into the extracted teeth. Paired t test was 0,001 and therefore it was concluded an influence of fluocol immersion in fluoride concentration

absorbed.

3. Fluoride concentration after immersing on fluoride toothpaste solution

It was shown a decrease of fluoride concentration before and after teeth immersing in fluoride toothpaste solution. It was proven fluoride absorption into the teeth. Paired t test found significancy level 0,325. There was no influences of fluoride toothpaste immersion on absorbed fluoride concentration.

4. Fluoride absorption after immersing in fluoride tablet; fluocol and fluoride toothpaste solution

From table 4 we can see that immersing in fluoride tablet solution resulted highest fluoride absorption, followed by immersing in fluocol solution and fluride toothpaste. Anova test resulted significancy level was 0.000, there was a differences influence on immersion with three group of treatment toward fluoride absorbtion.

DISCUSSION

The use of systemic fluoride through drinking water and fluoride tablets has been started about 25 years ago. Mechanism action of this systemic effect is to strengthen the tooth prior to tooth eruption. As an effect of this mechanism tooth become resistant to caries attack during tooth eruption. Fluoride is absorbed by email apatite and reduced solubility of apatite which increases endurance email to demineralization. However this systemic mechanism can generate negative effects which was the incidence of fluorosis, therefore another mechanism of fluoride delivery is needed to be developed [8].

Last findings demonstrated fluoride topically effects (applied directly / contact with the tooth) was the most appropriate method[9,10,11]. Mechanism action of topical fluoride is by enhancing remineralization and inhibiting demineralization, increasing fluoride concentration in saliva and plaque in consequence inhibit acid production by bacteria, can also reduce email solubility[12]. Fluoride in oral fluids can also serve to increase anti-caries effect by increasing precipitation of Fluoroapatite.

Topical fluoride modalities best applied in low doses and frequency of administration continuously. It was found that fluoride will have a major role in low doses in the process of demineralization and remineralization of dental hard tissue while fluoride in high doses would likely weaken email crystallization and increase the production of acid by bacteria[13].

Most studies have been conducted to prove effect of fluoride either pre or post-eruption effect is largely done in vivo, because measurement of fluoride concentration in saliva and dental plaque can be seen directly in oral cavity. Recent study was conducted in vitro, so the ideal situation in the oral cavity can not be achieved. The results showed the highest absorbed fluoride is after immersion of fluoride tablets (vinafluor 1 mg) and the lowest is the use of fluoride toothpaste.

This study used method of measuring fluoride concentration through medium of immersion therefore produces high concentration of fluoride tablets in solution (1 mg NaF). When dissolution in the Mill Q solution, fluoride concentration in the solution becomes high. While on fluocol solution, although NaF concentration high enough but by the time the dissolution with a solution MillQ taken only 3 drops therefore fluoride concentration is low. In immersion with fluoride toothpaste although lower doses are mixed in solution MillQ but fluoride concentrations were

detected before and after immersion quite high. This may be due at the time of fortification, fluoride concentration in toothpaste into a homogeneous solution, causing Mill Q fluoride detected high enough.

There was an influence of teeth immersion in different modalities of fluoride. Fluoride concentration in fluoride tablets soaking both before and after immersion is high enough, then the absorbed fluoride is also quite high. The highest absorption of fluoride found in immersion with fluoride tablets (vinafluor). In the clinical application, fluoride tablets administered systemically, so although high concentrations absorbed, some of fluoride concentration absorbed into blood plasma therefore not all be absorbed into teeth [14].

Immersion in fluocol solution result low fluoride concentrations both before and after immersion but absorption of fluoride concentration is higher than immerse with fluoride toothpaste. Fluocol is fluoride in the form of high concentration liquid, when it was centrifuged, such thick fluoride concentration will be absorbed into the tooth. Although at the time of measurement (before and after immersion) found fluoride low concentration due to fortification stage (homogeneity).

Soaking in fluoride toothpaste solution resulted the lowest fluoride concentration, this might be due to the resulting solution between toothpaste and Mill Q quite clear (dilute) so that when it was centrifuged, fluoride concentration absorbed become the lowest. In clinical applications, the use of fluoride toothpaste to give effect not only on the teeth topically, but also increases ions fluoride in saliva, plaque and plaque solution [15].

The study results do not conform with the recommendations given in terms of fluoride use. American Dental Association advocate for the use of low-dose fluoride preparations with a frequency of twice daily topically than high-dose topical and systemic[16]. This recommendations was given by consideration of the effect of fluoride absorbed not known how much fluoride was absorbed. Individual demands of fluoride added depend on the risk of caries individually. It also needs to consider the issue price (cost effectiveness), individually comfort, patient acceptance and security, also dentist advices.

CONCLUSION

There was an influence of immersing extracted teeth on different fluoride modalities toward fluoride aboserbed, the most effective was immersed in fluoride tablet.

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