

Atila ÖZDEMİR¹
Ahmet SAYAL²
Eralp AKÇA¹
Ahmet AYDIN²

The Determination of Salivary Zinc Level Following Delivery from Zinc Containing Toothpaste

Received: July 05, 1996

Department of¹ Periodontology,
²Pharmacology, Gülhane Military Medical
Academy, Ankara-Turkey

Introduction

Bacterial plaque plays a major role in the development of periodontal diseases. It has been defined many years ago that the left of the removal of supragingival plaque in healthy mouths leads to gingivitis hence it has been proven that periodic oral hygiene procedure will lead to healthy oral tissues (1, 2).

Gingivitis is a widespread disease, it has been indicated that 5-15% individuals who have gingivitis are at risk of severe periodontitis (3).

By considering the role of supragingival plaque in early periodontal disease (4, 5), the use of antiplaque agents to increase the effect of daily mechanical plaque control has been proven to be successful (6).

Taking in consideration the minority of toothbrushing and the duration (7), the use of antiplaque agents which have substantively at the site of action is beginning to gain more importance (8, 9).

The antiplaque effect of zinc salts has been determined in vivo (10, 11). The retention of zinc salts in the mouth especially the absorption of dental plaque after application was determined (12, 13).

The purpose of this study is to investigate how short period of toothbrushing with equal volumes of a toothpaste effects the salivary zinc levels over a period 7 hours.

Abstract: The effect of zinc salts is defined by several studies. The aim of this study is to investigate how the short period toothbrushing with equal volumes of a toothpaste containing 0.75% zinc citrate effects the salivary zinc levels over a period of 7 hours.

In our study a significant increase in zinc measurements was observed 5 minutes after toothbrushing.

Although 7th hour measurements were high-

er than 0 hour measurements; these values were found approximately similar to initial control measurements.

This result shows that the amount of zinc passed by toothpaste to saliva completely disappeared at the end of 7th hour. It's thought that by brushing the teeth within time period will increase the effect of the toothpaste.

Key Words: Zinc, toothpaste, saliva.

Material and Method

In this study a toothpaste containing 0.75% of zinc citrate was used. We performed this study in 10 male volunteers between ages of 25-35. The toothpaste was filled in a 2 cc injector afterwards we pressed 0.5 cc (579mg) of toothpaste from the injector containing 2.09 mg zinc on the toothbrushes.

Before starting the experiment salivary samples were taken for control purposes. Brushing was exercised over a period of 30 sec with the new toothbrushes afterwards individuals were asked to rinse their mouth 2 times with normal water. Next unstimulated salivary samples were taken on the 5th minute, first and second hours of the experiment and stored in special tubes. After lunch volunteers were asked not to brush their teeth so that another sample of salivary could be taken on the 7th hour of the experiment. So that real efficacy of the zinc was tried to be determined in routine life. The obtained salivary samples were stored in -25°C until the time of analysis. At the time of analysis the samples were taken out of the deepfreeze and once the samples were brought back to room temperature, 1 ml of the sample was transferred to polypropylene tube. Analysis was carried out with an atomic absorption spectrophotometer named Varian 30/40 (14). In our analysis we also used a zinc hollow cathode lamp, autosampler marked Varian PSC-56, zinc atomic absorption standard solution marked Sigma,

NUMBER	TIME	0	5 Minute	1 hour	2 hour	7 hour
1		0.140	3.804	2.786	0.782	0.168
2		0.652	3.895	1.078	0.608	0.146
3		0.064	0.852	0.346	0.274	0.190
4		0.054	3.923	0.758	0.240	0.094
5		0.094	3.514	1.714	0.586	0.136
6		0.122	3.615	1.540	0.478	0.254
7		0.155	3.720	1.158	0.710	0.176
8		0.110	3.635	2.310	0.730	0.198
9		0.092	3.490	1.870	0.540	0.121
10		0.221	3.780	1.394	0.627	0.249
Mean		0.170±0.176	3.423±0.195	1.495±0.721	0.557±0.182	0.173±0.052
		±				
Standard deviation						

Table 1. Salivary zinc levels by time (µg/ml)

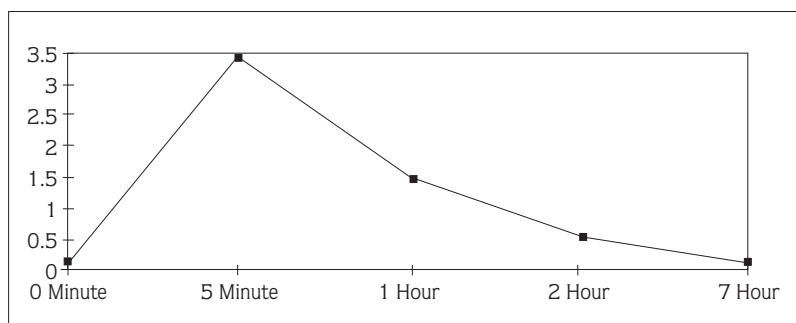


Table 2. The means of salivary zinc levels (µg/ml)

nitric acid (Merck), polypropylene tubes. After adding 1 ml 1% nitric acid solution in tubes; the mixture was shaken in Vortex machine over a period of 30 sec. Afterwards zinc levels of the samples were analyzed by the atomic absorption spectrophotometer.

Results

Salivary zinc levels were shown in table and figure. According to the table and figure, we assessed a maximum average in the 5th minute after brushing with a toothpaste containing zinc (3.423±0.195µg/ml) while salivary zinc level was (0.170±0.176µg/ml) in baseline measurements. At the end of 1 hour a significant decrease was observed (1.495±0.721µg/ml). The reduction in zinc level persisted until the end of 2nd hour and at the end of 7th hour zinc level was found approximately the same as initial measurements (Table and figure).

Discussion

Several agents have been started to use daily with

toothpastes and mouthrinses to control bacterial plaque and gingivitis. It was indicated that chlorhexidine was not compatible with the constituents of other product forms in toothpaste. However, non-charged agents such as metal salts and triclosan can be utilized by means of toothpastes (9, 15).

Oral substantiality is a necessary prerequisite of any agent for antiplaque activity in vivo. Data demonstrates that approximately 30% of zinc citrate is retained after brushing (16). Gilbert and Ingramm (1988) had demonstrated that after brushing with a 1 gr toothpaste containing zinc, 38% of the zinc was retained in oral tissues and the increase of zinc levels in bacterial plaque and saliva (12). Before this study, Gilbert had demonstrated that a quarter of zinc in antiplaque toothpaste is retained in the mouth and it has been indicated that zinc was still evident in saliva 2 hours after brushing (17).

Gilbert et al (1989) have demonstrated a correlation between the increase in the concentration of zinc and salivary zinc level with a mouthrinse containing 0.5% and 1% zinc citrate (18). Another study observing dosage-

response relation of toothpastes containing 0.5% and 1% zinc citrate was defined that zinc citrate has antiplaque activity which delays the development of gingivitis (19).

In our study, we determined a significant increase in salivary zinc levels in the 5th minute after brushing with a toothpaste containing zinc. Although there was a general increase in the 7th hour measurements, average values were found approximately similar to initial control measurement. Whether the increase in zinc level is consistent to a recent study (17), factors like brushing duration,

food uptake, mouthrinsing, toothpaste retained on toothbrush were thought to be effective in zinc level.

For the removal of supragingival plaque, primary preventions must be taken by individuals themselves (9). On the other hand there is a reality that preventions are not being applied effectively by the large portion of community (7, 20). That is why in spite of insufficient mechanical oral hygiene behavior, the use of long term retentive antiplaque agents would be useful in dental health of widespread of community, but long-term clinical studies are still necessary.

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