Effect of Casein Phosphopeptide-Amorphous Calcium Phosphate on the Microhardness and Microscopic Features of the Sound Enamel and Initial Caries-Like Lesion of Permanent Teeth Compared to Fluoridated Agents

A Thesis

Submitted to the Council of the College of Dentistry of the University of Baghdad, in Partial Fulfillment of the Requirements for the Degree of Master of Science in Preventive Dentistry

By

Ali Hadi Fahad

B. D. S.

Supervised by

Athraa Mustafa Al-Weheb

B.D.S., M.Sc.

2010 **1431**

Abstract

Background: Casein phosphopeptide-amorphous calcium phosphate derived from the milk protein casein. The proposed mechanism of anticariogenicity is that they act as a calcium-phosphate reservoir, buffering the activities of free calcium and phosphate ions in the plaque fluid helping to maintain a state of supersaturation with respect to enamel minerals, thereby depressing enamel demineralization and enhancing remineralization. Incorporation of casein phosphopeptide into the salivary pellicle can reduce the adherence of cariogenic bacteria.

Aims of the study: Test the effect of casein phosphopeptide-amorphous calcium phosphate on the microhardness before and after artificially initiated carious lesion of the outer enamel surface; in addition to the examination of the microscopic changes. Casein phosphopeptide-amorphous calcium phosphate effect was compared with that of sodium fluoride and stannous fluoride, while de-ionized water was used as control.

Materials and Methods: The teeth sample consisted of 65 maxillary first premolars, two teeth were used for sound and caries like lesion enamel ground section preparation, while other teeth were randomly divided into two groups, A and B. Group A was consisted of 42 teeth were randomly divided into five study groups and one control group. After production of initial carious like lesion of outer enamel surface, the teeth were treated by the selected agents for four minutes separately (casein phosphopeptide-amorphous calcium phosphate without and with fluoridated agents, sodium fluoride 0.05%, stannous fluoride 0.4%, and de-ionized water). Then each tooth was rinsed with de-ionized water for two minutes and restored in de-ionized water at 37˚C for the next day. This procedure was

repeated daily for one week. While Group B consisted of 21 teeth were randomly divided to three study groups, teeth treated with selected agents before demineralization by pH cycling procedure. Teeth were subjected to Vickers microhardness test and microscopic examination before and after the pH cycle and following the treatment with the selected agents.

Results: Group A showed that casein phosphopeptide-amorphous calcium phosphate agents, sodium fluoride and stannous fluoride were statistically highly significant in elevation of the microhardness values of demineralised enamel surface. However, none of the mentioned agents able to increase the microhardness to approximate the original values of sound enamel. In Group B, there was also an elevation of the microhardness values from sound enamel, which is statistically significant. Casein phosphopeptide-amorphous calcium phosphate with sodium fluoride caused highest change in the microhardness (207.21%) for Group A and (19.22%) for Group B, while the lowest change with stannous fluoride 0.4% (74.32%) for Group A and casein phosphopeptide-amorphous calcium phosphate (8.2%) for Group B.

Microscopic examination of enamel ground section under light microscope revealed that zone of remineralization in enamel and dentin was seen after treatment with all agents of study groups, but it revealed more with casein phosphopeptide-amorphous calcium phosphate with sodium fluoride.

Conclusions: The three agents of casein phosphopeptide-amorphous calcium phosphate were effective in remineralization of the outer enamel surface; which was reflected by increase in enamel microhardness values.