## Effect of Different Remineralization Protocols on Demineralized Enamel Surface Microhardness (Vitro Comparative Study)

A Thesis Submitted To Operative Dentistry Department, Faculty Of Dentistry, Ain Shams University In The Partial Fulfillment Of The Requirements Of Master Degree In Operative Dentistry

## By

#### Amani Abdullah Omer Bin Shahna

B.D.S Aden University (2006) (Aden –Yemen)



#### Prof. Dr. / Mokhtar Nagy Ibrahim

Prof. of Operative Dentistry Faculty of Dentistry Ain Shams University

#### Dr. / Omaima Hassan Ahmed Ghallab

Prof. and Head of Operative Dentistry department Faculty of Dentistry Ain Shams University

#### Dr. / Mohammed Nasser Mohammed Anwar

Lecturer of Operative Dentistry
Faculty of Dentistry
Ain Shams University



سورة البقرة الآية: ٣٢

# Acknowledgment

I'd like to express my respectful thanks and profound gratitude to **Prof. Dr./ Mokhtar Nagy Ibrahim,** Professor of Operative Dentistry, Faculty of Dentistry - Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, who passed away. Im so sorry that he is not with us today.

I am also delighted to express my deepest gratitude and thanks to **Dr./ Omaima Hassan Ahmed Ghallab**, Professor and head of Operative Dentistry Department, Faculty of Dentistry - Ain Shams University, for her kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.

I am deeply thankful to **Dr./ Mohammed Nasser Mohammed Anwar,** Lecturer of Operative Dentistry, Faculty of
Dentistry - Ain Shams University, for his great help, active
participation and guidance.



#### I wish to dedicate to this work to

- → To My Father, who has been a source of encouragement and inspiration to me throughout my life, you have activity supported me in my determination to find and realize my potential.
- ♣ To My Mother, who always inspires me with her love and prayers.
- ♣ To My Lovely Sister Nesreen and Lovely Brothers Omar, Hisham and Mohammed for their continuous encouragement.

## Contents

## **List of Contents**

Title	Page No.
List of Tables	i
List of Figures	ii
List of Abbreviations	iv
Introduction	1
Review of Literature	3
Aim of the Study	27
Materials and Methods	28
Results	39
Discussion	44
Summary and Conclusions	51
References	5٣
Arabic Summary	

## **List of Tables**

Table No.	Title	Page No.
<b>Table (1):</b>	Materials, Description, composition, manufacture and lot numbers	28
<b>Table (2):</b>	One way ANOVA for the effect of the application (7 days) of remineralizing agents on the micro hardness of demineralized enamel	39
<b>Table (3):</b>	Mean ± standard deviation values of the effect of remineralization on the micro hardness of, sound and demineralized enamel groups and remineralizing groups	40

## **List of Figures**

Fig. No.	Title	Page No.
Figure (1):	GC MI past + GC MI past plus	29
Figure (2):	Listerine Total care zero mouth wash.	30
Figure (3):	Demineralization solution and artificial saliva.	30
Figure (4):	Thirty non carious human premolars with cut roots.	32
Figure (5):	a: crown vertically sectioned into two equal halves. b: enamel specimen in PVC mold and c: enamel specimen embedded in an acrylic resin.	32
Figure (6):	sixty enamel specimens were embedded in self –acrylic	32
Figure (7):	Specimens grouping	33
Figure (8):	Immersion of enamel specimen in 10ml of demineralization solution.	34
Figure (9):	Specimen rubbed with remineralizing agent	35
<b>Figure (10):</b>	(a) specimen treated by Listerine total care zero mouth wash,(b) specimen placed in the artificial saliva	35
Figure (11):	<b>a:</b> microhardeness testing machine, <b>b:</b> specimen placed in microhardeness testing machine.	36
<b>Figure (12):</b>	Environmental Scanning electron microscope. (ESEM)	37
<b>Figure (13):</b>	Enamel specimens were subjected ESEM evaluation.	37
Figure (14):	Bar chart for the effect of the period of application (7 days) of remineralizing agents (MI paste, MI paste plus and Listerine total care zero Mw and MI paste +Listerine total care zero Mw) on the micro hardness of demineralized enamel.	40

Fig. No.	Title	Page No.
Figure (15):	ESEM micrographs of the normal enamel under (5000x) mangnification showed the enamel surface look smooth (Key hole appearance).	41
Figure (16):	ESEM microphptographs of the enamel surface treated by demineralization solution under (5000x) mangnification showed irregular, roughened appearance with depressed enamel prism cores (blue arrowe).	41
<b>Figure (17):</b>	ESEM photomicrograph of demineralized enamel surface treated with MI paste for 7 days under (5000x) magnification. Parts Areas showing of reformation of characteristic key hole appearance of the end of enamel rod (blue arrow)	42
<b>Figure (18):</b>	ESEM photomicrograph of surface treated with MI paste plus for 7 days under (5000x) magnification all areas showing reformation of characteristic key hole appearance of the sound enamel surface (Blue arrow).	42
Figure (19):	ESEM photomicrograph of surface treated with MI paste +Listerine total care zero mouth wash for 7days under (5000x) magnification, it showed areas reformation of characteristically key hole appearance (blue arrow).	43
Figure (20):	ESEM photomicrograph of surface treated Listerine total care zero mouth wash under (5000x) magnification showed deposition of minerals with unclear and unidentified surface appearance.	43

#### **List of Abbreviations**

