HISTOPATHOLOGICAL RESPONSE OF THE DENTAL PULP TO THREE DIFFERENT PULP CAPPING MATERIALS

Thesis submitted to the Faculty of Dentistry, Ain Shams University in Partial Fulfillment of the Requirements of Doctor's Degree in Operative Dentistry

By

Reham Sayed Abd EL Mageed Abd Allah

B.D.S 2003; M.S.C 2011 -Ain Shams University

بسم الله الرحمن الرحيم " قالوا سبحنك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم "

صدق الله العظيم

سورة البقرة الأية ٣٢



Prof. Moktar Nagy Ibrahim

Prof. of Operative Dentistry Faculty of Dentistry Ain Shams University

Prof. Mohamed Hussein Zaazau

Prof. of Restorative Dentistry
Restorative and Dental Materials Department
National Research Centre

Prof. Ashraf Mohamed Abd El Rahman

Prof .of Surgery, Anesthesia and Radiology Faculty of Veterinary Cairo University



First of all, thank God who always helps me in all my life.

I had a great honor to undertake this research under the valuable supervision of **Prof. Moktar Nagy Ibrahim** Prof. of Operative Dentistry Faculty of Dentistry - Ain Shams University, to whom I feel most grateful for his unsurpassed guidance and support in accomplishing this work.

Special thanks to **Prof. Mohamed Hussein Zaazau** Prof. of Restorative Dentistry, Restorative and Dental Materials Department, head of Oro-dental Division - National Research Centre, for his great support and care till this work become a reality.

My deep thanks to **Prof. Ashraf Mohamed Abd El Rahman**Prof of Surgery, Anesthesia and Radiology Faculty of Veterinary Cairo University, for his continuous help and encouragement.

Special thanks to **Dr. Shaymaa Mohamed Nagi** researcher at Restorative and Dental Materials Department - National Research Centre, for the valuable guidance through the various stages of this study.

My deep thanks **Dr. Sameh Abd El Alim** researcher at Pharmaceutical Technology Department - National Research Centre, for his valuable help and support throughout this study.

Never forget to thanks **Dr. Maram Ezzat Khallaf** researcher at Restorative and Dental Materials Department - National Research Centre, for her endless help in accomplishing this work.



This work is dedicated

To the soul of my wonderful father and my lovely uncle whom I always wished to celebrate such a good day with me. Special dedication to my great mother for her everlasting love and support. To my sister and my brother for their continuous encouragement. To my kind husband, my superhero son Suhail and my cute shiny daughter Fayrouz whom I always get thankful.

List of Contents

Title	Page
List of Tables	i
List of Figures	iv
Introduction	1
Review of literature	4
1. Pulp capping materials:	
a. Mineral trioxide aggregate	5
b. Propolis	10
2. Pulp capping techniques:	
a. Direct pulp capping	15
b. Indirect pulp capping	21
3. Histopathological response after pulp capping	24
4. Dentin bridge formation after pulp capping	29
Aim of the study	35
Materials and methods	36
Results	52
Discussion	87
Summary and conclusions	96
References	99
Arabic summary	

List of Tables

Table	I	Page
Table (1)	Materials name, compositions brand manufacturers	. 36
Table (2)	The variables of the study.	38
Table (3)	Interaction between the variables.	39
Table (4)	Inflammatory reaction scoring system.	50
Table (5)	Reparative dentin bridge scoring system	51
Table (6)	Inflammatory scores for direct and indirect pulp capping techniques using MTA at different observation periods.	66
Table (7)	Inflammatory scores after different observation Periods for direct and indirect pulp capping techniques using MTA.	68
Table (8)	Inflammatory scores for direct and indirect pulp capping techniques using Propolis at different observation periods.	69
Table (9)	Inflammatory scores after different observation periods for direct and indirect pulp capping techniques using Propolis	71

Table (10):	capping techniques using NaCl at different observation periods.	72
Table (11):	Inflammatory scores after different observation periods for direct and indirect pulp capping techniques using NaCl.	74
Table (12):	Comparison between different pulp capping materials used in direct pulp capping technique at different observation periods regarding inflammatory scores.	75
Table (13):	Comparison between different pulp capping materials used in indirect pulp capping technique at different observation periods regarding inflammatory scores.	77
Table (14):	Dentin bridge scores in different pulp capping techniques, at different observation periods using MTA.	78
Table (15):	Dentin bridge scores after different observation periods for direct and indirect pulp capping techniques using MTA.	79
Table (16):	Dentin bridge scores in different pulp capping techniques, at different observation periods using Propolis.	81
Table (17):	Dentin bridge scores after different observation periods for direct and indirect pulp capping techniques using Propolis.	82

Table (18):	Dentin bridge scores in different pulp capping techniques, at different observation periods using NaCl.	83
Table (19):	Dentin bridge scores after different observation periods for direct and indirect pulp capping techniques using NaCl.	84
Table (20):	Comparison between pulp capping materials used in direct pulp techniques at different observation regarding dentin bridge scores.	85
Table (21):	Comparison between pulp capping materials used in indirect pulp capping technique at different observation period regarding dentin bridge scores.	86

iii

List of Figures

Figure	Pa	ge
Figure (1)	Mineral Trioxide Aggregate (MTA).	37
Figure (2)	Experimental Propolis paste.	37
Figure (3)	Expermintal hypertonic sodium chloride gel.	37
Figure (4)	Resin modified glass ionomer (Photac Fil).	37
Figure (5)	Propolis powder.	45
Figure (6)	Anesthetized dog with a modified plastic syringe.	45
Figure (7)	Prepared cavity.	45
Figure (8)	Cavity for direct pulp capping.	47
Figure (9)	Cavity for indirect pulp capping.	47
Figure (10)	Pulp capping materials.	47
Figure (11)	Photomicrographs of a section in the MTA group after 1 week of direct contact with exposed pulp (H&E, 5x).	52
Figure (12)	Photomicrograph of a section in the MTA group after 1 week of direct contact with exposed pulp (H&E, 10x).	53
Figure (13)	Photomicrograph of a section in the Propolis group after 1 week of direct contact with exposed pulp (H&E, 5x).	54

Figure (14)	Photomicrograph of a section in the Propolis group after 1 week of direct contact with exposed pulp (H&E, 10x).	54
Figure (15)	Photomicrograph of a section in the NaCl group after 1 week of direct contact with exposed pulp (H&E, 10x).	55
Figure (16)	Photomicrograph of a section in the MTA group after 2 months of direct contact with exposed pulp (H&E, 10x).	56
Figure (17)	Photomicrograph of a section in the Propolis group after 2 months of direct contact with exposed pulp (H&E, 10x).	57
Figure (18)	Photomicrograph of a section in the NaCl group after 2 months of direct contact with exposed pulp (H&E, 10x).	57
Figure (19)	Photomicrograph of a section in the MTA group after 3 months of direct contact with exposed pulp (H&E, 10x).	58
Figure (20)	Photomicrograph of a section in the Propolis group after 3 months of direct contact with exposed pulp (H&E, 10x).	59
Figure (21)	Photomicrograph of a section in the NaCl group after 3 months of direct contact with exposed pulp (H&E, 10x).	60
Figure (22)	Photomicrograph of a section in MTA group after 1 week of indirect pulp capping (H&E, 10x).	61

Figure (23)	Photomicrograph of a section in Propolis group after 1 week of indirect pulp capping (H&E,10x).	61
Figure (24)	Photomicrograph of a section in NaCl group after 1 week of indirect pulp capping (H&E,10x).	62
Figure (25)	Photomicrograph of a section in MTA group after 2 months of indirect pulp capping (H&E,10x).	62
Figure (26)	Photomicrograph of a section in Propolis group after 2 months of indirect pulp capping (H&E,10x).	63
Figure (27)	Photomicrograph of a section in NaCl group after 2 months of indirect pulp capping (H&E,10x).	63
Figure (28)	Photomicrograph of a section in MTA group after 3 months of indirect pulp capping (H&E,10x).	64
Figure (29)	Photomicrograph of a section in Propolis group after 3 months of indirect pulp capping (H&E,10x).	64
Figure (30)	Photomicrograph of a section in NaCl group after 3 months of indirect pulp capping (H&E,10x).	65
Figure (31)	Inflammatory scores for direct and indirect pulp capping techniques using MTA at different observation periods.	67
Figure (32)	Inflammatory scores after different observation periods for direct and indirect pulp capping techniques using MTA.	68
Figure (33)	Inflammatory scores for direct and indirect pulp capping techniques using Propolis at different observation periods.	70