



Evaluation of Antimicrobial Effect of Three Resin Based Sealers (An In Vitro Study)

A thesis

Submitted to the Faculty of Dentistry, Ain Shams University
for Partial Fulfillment of Requirements of the master degree in
Endodontics

By

Shereen Ahmed Adel Hassan Mazyona

B.D.S (2007)

Faculty of Dentistry
Ain Shams University
2016

SUPERVISORS

Dr. Kariem El Batouty

Associate Professor of Endodontics
Faculty of Dentistry, Ain Shams University

Dr. Medhat Taha

Lecturer of endodontics
Faculty of dentistry, Ain Shams University

Dr. Youssef El Kenany

Professor of microbiology and bacteriology
faculty of Agriculture, Ain Shams university

بسم الله الرحمن الرحيم

وسع ربنا كل شيء علما على الله توكلنا

ربنا افتح بيننا وبين قومنا بالحق

وانت خير الفاتحين

صدق الله العظيم

سورة الأعراف {89}

DEDICATION

To those who gave me much care and support

My beloved Husband

The most kind and wonderful partner ever

My dear Mother

The light & care that leads the way

My dear Father

The wisdom that keeps me going on

My lovely daughters

The source of my smile

Acknowledgement

*I would like to express my utmost gratitude and deep appreciation to **A. prof. Kariem El Batouty** Associate Professor of Endodontics Faculty of Dentistry, Ain Shams University, for his academic supervision and continuous encouragement he offered throughout the accomplishment of this work. It was a great honor to work under his tutelage.*

*My due thanks to **Dr. Medhat Taha** Lecturer of endodontics Faculty of dentistry, Ain Shams University for his encouragement, experience, and valuable advices he offered throughout this work.*

*My due thanks to **Dr. Youssef El Kenany** Professor of microbiology and bacteriology faculty of Agriculture, Ain Shams university University for his encouragement, experience, and valuable advices he offered throughout this work.*

Shereen Ahmed Adel Hassan Mazyona

LIST OF CONTENTS

Title	Page
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	3
I. Role of Enterococcus faecalis in progression of endodontic disease	4
II. Antibacterial effect of resin sealers	16
3. AIM OF THE STUDY	39
4. MATERIALS AND METHODS	40
5. RESULTS	57
6. DISCUSSION	80
7. SUMMARY	89
8. CONCLUSIONS	91
9. REFERENCES	92
10. ARABIC SUMMARY	99

LIST OF FIGURES

Fig. No.	Title	Page
1	Photograph showing the luminar flow chamber	47
2	Photograph showing sterile cotton tipped applicator	47
3	Photograph showing spreading of the bacteria on the agar plate	48
4	Photograph showing punching 3 wells in the agar plate by sterile punsh	48
5	Photograph showing the incubator	49
6	Photograph showing measuring of the inhibition zone using the electronic polygauge	49
7	Photograph showing The 96-well plate to enter the microplate reader	55
8	Photograph showing applying of a thin layer of equal amounts of fresh sealer on the walls of the well	55
9	Photograph showing applying of the <i>E. faecalis</i> directly to the fresh sealer using the micropipette	56
10	Photograph showing addtion of 245 µl of sterile BHI broth into each well	56

Fig. No.	Title	Page
11	Diagram showing Line chart showing mean values of group I in different times	58
12	Photographs showing plates representing samples of inhibition zone of group I, sub group A	58
13	Photographs showing plates representing samples of inhibition zone of group I, sub group B	59
14	Photographs showing plates representing samples of inhibition zone of group I, sub group C	59
15	Line chart showing mean values for group II in different times	60
16	Photographs showing plates representing samples of inhibition zone of group II, sub group A	61
17	Photographs showing plates representing samples of inhibition zone of group II, sub group B	61
18	Photographs showing plates representing samples of inhibition zone of group II, sub group C	62
19	Line chart showing mean values in group III in different times	63
20	Photographs showing plates representing samples of inhibition zone of group III ,sub group A	63

Fig. No.	Title	Page
21	Photographs showing plates representing samples of inhibition zone of group III ,sub group B	64
22	Photographs showing plates representing samples of inhibition zone of group III ,sub group C	64
23	Column chart showing mean values in different groups in sub group A	66
24	Column chart showing mean values in different groups in subgroup B	67
25	Column chart showing mean values in different groups in sub group C	68
26	Column chart showing mean values in different groups in different times	69
27	Line chart showing mean values of direct contact test reading for group I	70
28	Line chart showing mean values of direct contact test reading for group II	72
29	Line chart showing mean values of direct contact test reading for group III	73
30	Column chart showing mean values of direct contact test reading in subgroup A	74

Fig. No.	Title	Page
31	Column chart showing mean values of direct contact test reading in sub group B	76
32	Column chart showing mean values of direct contact test reading in sub group C	77
33	Column chart showing mean values of direct contact test	79

LIST OF TABLES

Table No.	Title	Page
1	Showing the materials used in this study and their manufacturer, components and composition	40
2	Showing classification of samples of agar diffusion test	43
3	Showing classification of samples of direct contact test	51
4	Showing Mean \pm SD of inhibition zone diameter of AH plus (group I) after different time intervals	57
5	Showing Mean \pm SD of inhibition zone diameter of RealSeal SE (group II) after different time intervals	60
6	Showing Mean \pm SD of inhibition zone diameter of Metaseal (group III) after different time intervals	62
7	Showing Mean \pm SD of inhibition zone diameter after 1 day (sub group A) for the three sealers	65
8	Showing Mean \pm SD of inhibition zone diameter after three days (sub group B) for the three sealers	66

Table No.	Title	Page
9	Showing Mean \pm SD of inhibition zone diameter after 7 days (sub group C) for the three sealers	68
10	Showing Mean \pm SD of inhibition zone diameter for the three sealers in different durations	69
11	Showing Mean \pm SD of antibacterial effect of group I in different duration	70
12	Showing Mean \pm SD of antibacterial effect of group II in different duration	71
13	Showing Mean \pm SD of antibacterial effect of group III in different duration	73
14	Showing Mean \pm SD of antibacterial effect after 7 days (sub group A)of the three sealers	74
15	Showing Mean \pm SD of antibacterial effect after 7 days (sub group B)of the three sealers	75
16	Showing Mean \pm SD of antibacterial effect after 7 days (sub group C) of the three sealers	77
17	Showing Mean \pm SD of antibacterial effect for the three sealers in different durations	78

LIST OF ABBREVIATIONS

BHI	:	Brain Heart Infusion
PCR	:	Polymerase chain reaction
E. faecalis	:	Enterococcus faecalis
ADT	:	Agar Diffusion Test
DCT	:	Direct Contact Test
MDCT	:	Modified direct contact test
MGP	:	Medicated Gutta Percha
CFU	:	Colony forming unit
GTP	:	Green tea polyphenols
PBS	:	Phosphate buffered saline
TSA	:	Teflon seeded agar
OD	:	Optical density

The main goal of root canal treatment is to fight against microorganisms that are existing in the root canal system whether to remove, prevent re-entrance or to entomb it in the canal system.

Chemo-mechanical preparation with different systems and the use of medication in addition to proper obturation techniques that may contain additive medication are also used to act against this infection.

With all the improvements in endodontic techniques, we never achieve the perfect system that can completely eradicate the microorganism from the root canal system. In a comparison between the endodontic rotary files preparation and the manual step back technique, the findings showed that none of these techniques resulted in bacteria free canals. Several studies have shown the presence of microorganism even after a comprehensive chemo-mechanical preparation of a complex root canal system.

Microorganisms infecting root canal dentin might adhere superficially to the dentinal wall or penetrate deeper into the dentinal tubules. *Enterococcus faecalis* is a resilient bacterium frequently recovered from obturated root canals with signs of apical periodontitis. The presence of *E. faecalis* at the time of obturation can significantly reduce the success rate of root canal treatment.

Therefore it is advantageous for the sealer to exert some antimicrobial activities as the last element in the treatment regimen. The antimicrobial properties of the sealers should ensure the elimination of bacteria as well as prevent the re-

infection, specially as the bacteriological sampling before obturation is not a routine procedure. That's why root canal sealers with good antimicrobial activity are desired to kill surviving microorganisms

Although predictable clinical results have been reported with the use of nonbonding root canal sealers, there has been a continuous quest for alternative sealers or techniques that bond simultaneously to canal wall dentine as well as filling material.

Therefore it was thought to be of value to conduct study to compare between three different resin sealers currently available in the market regarding their antibacterial effect.