Fracture Strength and Coronal Sealing Ability of Endodontically Treated Teeth Restored with Different Post Systems
(An In-Vitro Study)

Thesis

Submitted to Endodntic Department,
Faculty of Dentistry, Ain Shams University
In Partial Fullfillment for the Requirement
of Master Degree in Endodntics

By

Wassim Essam Boshra
(B.D.S) Faculty of Dentistry
Ain Shams University

Faculty of Dentistry
Ain Shams University
(2012)

Supervised by

Dr. Ehab El Sayed Hassanein

Professor of Endodontics and Chairman
Of Endodontic Department,
Faculty of Dentistry, Ain Shams University

Dr. Kariem Mostafa Elbatouty

Associate Professor of Endodontics
Faculty of Dentistry,
Ain Shams University,

Faculty of Dentistry
Ain Shams University
(2012)

قوة الكسر والإغلاق التاجى للأسنان المعالجة جذريا والمرممة بنظم اوتاد مختلفة

دراسة معملية

توطئه للحصول على درجة ماجستير فى علاج الجذور

كلية طب اسنان - جامعة عين شمس

مقدمة من

وسيم عصام بشرى

بكالوريوس طب اسنان

كلية طب اسنان - جامعة عين شمس.

كلية طب إسنان

جامعة عين شمس

٢٠١٢

المشرفون

أ.د إيهاب السيد حسانين

استاذ ورئيس قسم علاج الجذور

كلية طب اسنان - جامعة عين شمس.

أ.م.د كريم مصطفى البطوطى

أستاذ مساعد علاج الجذور

كلية طب اسنان - جامعة عين شمس

كلية طب إسنان

جامعة عين شمس

٢٠١٢

Dedication

This work is dedicated to . . .

My beloved father, **to whom I owe everything I ever did in my life and will achieve**

My mother **for always being there for me**

My sister **for her support**

Finally *my wife and my lovely twins (Seif and Mariam)* for being the light of my life

Aknowledgment

First thanks to **GOD** *to whom I relate any success in achieving any work in my life.*

I would like to express my deepest gratitude and appreciation to **Prof. Ehab Elsayed Hassanein,** *Professor of Endodontics and Chairman of Endodontic Department, Faculty Of Dentistry, Ain shams university. It has been a great honour to work under his kind supervision.*

I would also like to extend appreciation to **Dr. Kareim Mostafa Elbatouty,** *Associate Professor of Endodontics, Endodontic Department, Faculty of Dentistry, Ain Shams University for his sincere guidance and cooperation.*

Finally my extremely warm and sincere gratitude goes with love to **Dr. Wagdi Farid Ezzat** *for his sincere support.*

Wassim Essam Boshra

List of Contents

Title	Page No.
List of tables	II
List of Figures	IV
Introduction	1
Review of Literature	3
Aim of the Study	42
Material and Methods	43
Results	56
Discussion	78
Conclusion	91
Recommendation	92
Summary	93
References	97
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table (1):	Descriptive statistics of fracture resistance test results for both irrigation as function of post.	57
Table (2):	Comparison of fracture resistance results (Mean±SDs) between Naocl and CHX groups with metal posts.	59
Table (3):	Comparison of fracture resistance results (Mean ± SDs) between NaOCl and CHX groups with Glass fiber post	60
Table (4):	Comparison of fracture resistance results (Mean ± SDs) between NaOCl and CHX groups with zirconia post.	61
Table (5):	Comparison between fracture resistance test results with NaOCl irrigation as function of post	63
Table (6):	Comparison between fracture resistance test results with CHX irrigation as function of posts.	64
Table (7):	Two way analysis of variance ANOVA test of significance comparing variables affecting fracture resistance mean values.	66
Table (8):	Descriptive statistics of coronal leakage test results for both irrigation as function of posts.	68
Table (9):	Comparison of coronal leakage results (Mean ± SDs) between NaOCl and CHX groups with metal post.	70

List of Tables (Cont...)

Table No.	Title	Page No.
Table (10):	Comparison of coronal leakage results (Mean ± SDs) between NaOCl and CHX groups with Glass fiber post.	71
Table (11):	Comparison of coronal leakage results (Mean ± SDs) between NaOCl and CHX groups with zirconia post.	72
Table (12):	Comparison between coronal leakage test results with NaOCl irrigation as function of posts.	74
Table (13):	Comparison between coronal leakage test results with CHX irrigation as function of post.	75
Table (14):	Two way analysis of variance ANOVA test of significance comparing variables affecting coronal leakage mean values.	77

List of Figures

Fig. No.	Title	Page No.
Fig. (1):	A diagram showing classification of samples.	45
Fig. (2):	A diagram showing the Coronal tooth structure was reduced to flat plane at height of 2 mm.	47
Fig. (3):	A Diagram showing post space and core preparation	49
Fig. (4):	A photograph showing the universal loading testing machine (LRX-plus Llyod instrument).	51
Fig. (5):	Showing Schematic drawing of clinical model and study load angle.	52
Fig. (6):	Showing the angle of the rod of the instrument directed at the palatal surface 3mm below the incisal edge of the tooth model.	52
Fig. (7):	A diagram showing fluid infiltration testing apparatus.	55
Fig. (8):	A column chart of fracture resistance mean values for both irrigation	57
Fig. (9):	A column chart of fracture resistance mean values for NaOCl and CHX groups with metal post	59
Fig. (10):	A column chart of fracture resistance mean values for NaOCl and CHX groups with Glass fiber post	60
Fig. (11):	A column chart of fracture resistance mean values for NaOCl and CHX groups with zirconia post	61

List of Figures (Cont...)

Fig. No.	Title	Page No.
Fig. (12):	A column chart of fracture resistance mean values for NaOCl irrigation as function of post	63
Fig. (13):	A column chart of fracture resistance mean values for CHX irrigation as function of post	64
Fig. (14):	A column chart of comparing variables affecting fracture resistance mean values	66
Fig. (15):	A column chart of coronal leakage mean values for both irrigation as function of post.	68
Fig. (16):	A column chart of coronal leakage mean values for NaOCl and CHX groups with metal post.	70
Fig. (17):	A column chart of coronal leakage mean values for NaOCl and CHX groups with Glass fiber post	71
Fig. (18):	A column chart of coronal leakage mean values for NaOCl and CHX groups with zirconia post	72
Fig. (19):	A column chart of coronal leakage mean values for NaOCl irrigation as function of post	74
Fig. (20):	A column chart of coronal leakage mean values for CHX irrigation as function of post	75
Fig. (21):	A column chart of comparing variables affecting coronal leakage mean values	77

List of Abbreviations

Abb.	Full term
CEJ	*Cementoenamel junction*
CHX	*Chlorohexidine*
NaOCl	*Sodium hypochlorite*

INTRODUCTION

After root canal treatment, the restoration of the endodontically treated teeth (ETT) is required. This is because endodontically treated teeth are more susceptible to fracture than vital one. Post and core systems are frequently used to restore endodontically treated teeth with extensive loss of tooth structure. These restored teeth have been found to exhibit high risk of fracture than vital teeth due to caries, trauma, and excessive removal of radicular dentin during endodontic treatment [(1)].

The choice of an appropriate restoration for endodontically treated teeth is guided by strength and esthetics. Posts are classified into two types; non esthethic posts (stainless steel, titanium), esthetic (glass fiber, zirconium). Non esthetic metallic posts used were increasingly being called into question for reasons of esthetics and biocompatibility; where they produce a greyish discoloration of all ceramic crowns and the surrounding gingiva [(2)]. In addition roots in which metallic posts were inserted are more prone to fracture due to high modulus of elasticity of metal posts (200Mpa) compared to that of dentin (14Mpa).

The restoration of endodontically treated teeth with metal-free, physiochemically homogeneous material [(3)] that have physical properties similar to those of dentin has become a major objective in dentistry. New tooth coloured posts (glass fiber reinforced polymer, and ceramic posts) have improved the esthetics of teeth restored with posts and cores. In addition, zirconia ceramic may offer superior strength compared to other post materials.

Therefore the purpose of the current study was to evaluate and compare the fracture resistance and coronal sealing ability of different types of metallic and non metallic post systems.

REVIEW OF LITERATURE

Successful root canal treatment of intact tooth reduces its resistance to fracture by 5% and in situations where MOD restorations, the resistance to fracture reduced by 69%. Also coronal leakage is greatly affected, which leads to failure. Some authors stated that post space preparations that is made to increase the fracture resistance can cause an increase in coronal leakage.

Effect of post insertion on Fracture resistance of endodontically treated teeth:

In an effort to improve the fracture resistance of endodontically treated teeth restored with post and core system, researches has focused on post materials, designs, luting agents and ferrule effect. It was hypothesized that the dentin like rigidity allows for reduction of stress concentration between dentin-post interface and forces could be more evenly transferred to the root. Consequently, the incidence of root fracture might decrease. Several studies have investigated the fracture resistance of fiber posts since their introduction and compared it with that of metal posts. Some authors reported that endodontically treated teeth restored with fiber posts showed decrease fracture resistance compared to that of teeth restored with metal posts.

Mannocci et al. (1999)[4] compared the performances of teeth restored with quartz fiber, carbon-quartz fiber, and zirconium-dioxide posts covered with all-ceramic crowns when subjected to a cyclic loading test performed in a wet environment. Forty single-rooted human lower