بسم الله الرحمن الرحيم

﴿وقالوا سبحانك لا علم لنا إلا ما

علمتنا إنك أنت العليم الحكيم﴾

صدق الله العظيم

سورة البقرة ﴿٣٢﴾

EFFECT OF DIFFERENT SURFACE TREATMENTS ON RETENTION AND MICROLEAKAGE OF FIBER-REINFORCED COMPOSITE POSTS

Thesis submitted to

The Faculty of Oral and Dental Medicine

Cairo University

For partial fulfillment of the

Requirements of Master Degree in

Fixed prosthodontics

By

Noha Abdulla Mahmoud Zeid

B.D.S. (2003)

Misr University for Science and Technology

Faculty of Oral and Dental Medicine

Cairo University

2010

Supervisors

Dr. Sahar Gamal El Din Zaki

Assistant Professor of Fixed prothodontics

Faculty of Oral and Dental Medicine

Cairo University

Prof.Dr. Ashraf Hussien Sherif

Professor of Fixed prothodontics

Faculty of Oral and Dental Medicine

Cairo University

Dr. Hanaa Ibraheem Sallam

Lecturer of Fixed prothodontics

Faculty of Oral and Dental Medicine

Cairo University

Acknowledgment

First and foremost, I feel always indebted to ALLAH, the only kind and most merciful, who guided and aided me to bring this work to light.

I'm greatly honored to express my deepest gratitude and sincere appreciation to **Dr. Sahar Gamal El Din Zaki ,**Assistant Professor of Fixed prosthdontics, Faculty of Oral and Dental Medicine, Cairo University , for her generous help , supervision and valuable discussion during the entire course of the work.

I would like to express my deep gratitude and honor to **Prof. Dr. Ashraf Hussien Sherif,** Professor of Fixed prosthdontics, Faculty of Oral and Dental Medicine, Cairo University, for his continuous support and encouragement throughout this work. His valuable suggestions and guidance are highly appreciated.

Many thanks and appreciation to **Dr. Hanaa Ibraheem Sallam** lecturer of Fixed prosthdontics, Faculty of Oral and Dental Medicine, Cairo University, for her great help, support and extensive patience during the different phases of this work.

I'm greatly thankful to **Prof. Dr. Ihab El-Sayed Mosleh**, Professor and Head of Fixed prosthodontic department, Faculty of Oral and Dental Medicine, Cairo University, for his encouragement throughout this work.

I would like to thank **Prof. Dr. Ashraf Hassan Mokhtar**, Professor and Former Head of Fixed prosthodontic department, Faculty of Oral and Dental Medicine, Cairo University, for his help and support to complete this work.

Finally, this work couldn't be possible without the extraordinary help of my family.

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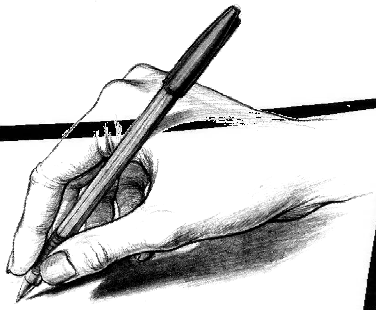


INTRODUCTION

Endodontically treated teeth are known to present a higher risk of biomechanical failure than vital teeth, as in most cases the remaining tooth structure will be less than in vital teeth because the most frequently occurring reason for endodontic treatment needs is deep caries. Additionally, further loss of tooth structure takes place during the preparation of the access cavity and canal preparation.

Posts are generally indicated to restore pulpless teeth, available prefabricated posts were traditionally made of metal, and their use resulted in complex combinations of materials (dentin, metal posts, cements, and core materials) with different degrees of stiffness(1).

The choice of an appropriate restoration for endodontically treated teeth is guided by strength and esthetics. Newer tooth-colored posts have improved the esthetics of teeth restored with posts and cores. (2)

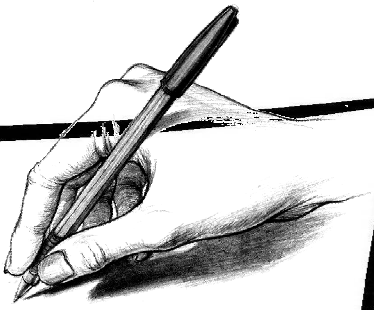
Prefabricated fiber-reinforced composite (FRC) posts have been used since the beginning of the 90s. The use of fiber posts to restore teeth with excessive loss of coronal structure is gaining widespread acceptance with dental clinicians. The presence of fibers is a further advantage because fibers distribute stress on a wider surface area, remarkably increasing the load threshold at which the material begins to show micro-fractures. Among the properties of fiber-reinforced materials; high impact resistance, attenuation and softening of vibrations, shock absorption and increased fatigue resistance (3).

Several characteristics of these posts have contributed to their popularity. They have comparable elastic properties to dentin, inducing a stress field similar to that of natural tooth. This results in a reduction in the incidence of root fractures, demonstrated in both in vitro and clinical studies. Moreover, the chemical nature of the posts allows them to be bonded to canal walls with adhesive systems in combination with resin cements, avoiding friction between dentin walls and the post, and reinforcing the remaining tooth structure. [4]

Retention of fiber-reinforced composite (FRC) posts within root canals is affected by several factors such as: type of post, its adaptation into the post space, and type of adhesive. Post cementation into a root canal is still a concern, as confirmed by clinically observed failures.

Surface treatments are common methods for improving the general adhesion properties of a material, by facilitating chemical and micromechanical retention between different constituents. There are different surface treatments that have been advocated such as surface roughening by airborne particle abrasion [5, 6], chemical treatments to optimize the chemical bond between the cement and the post, such as silane coating, [7, 8] and surface roughening in addition to chemical treatment [9, 10].

Fewer researches have been published regarding the effect of different surface treatments on the retention and leakage of the newer prefabricated fiber reinforced composite posts cemented to the root canal with resin-based cement. Therefore, it was found valuable to investigate the effect of different surface treatments on retention and microleakage of fiber reinforced posts.



REVIEW OF LITERATURES

The longevity of endodontically treated teeth has been greatly enhanced by continuing developments made in endodontic therapy and restorative procedures. After endodontic therapy a tooth must be restored to both functional and esthetic demands. Endodontically treated teeth with loss of coronal tooth structure either due to caries or during preparation of access cavity generally require a radicular post as a means to support the final restoration [(11)]

Fiber reinforced composite posts

Adhesively luted fiber-reinforced composite (FRC) posts were introduced in 90's [(12)] and have been increasingly used for the restoration of endodontically treated teeth in recent years. They are considered viable alternatives to metal posts when strength, stiffness and resistance to corrosion are required in the restoration of root filled teeth [(13)].

The major advantage of fiber posts is their similar modulus of elasticity to that of dentin, producing a stress field similar to that of natural teeth, whereas metal posts exhibit high stress concentrations at the post dentin interface [(14, 15)]. The properties of (FRC) posts depend on type, direction of fibers and nature of the matrix. Addition of fibers to a polymer matrix can improve significantly its physical and mechanical properties [(16)].

Several studies evaluated the retentive strength of FRC posts[(17,18)], others investigated the flexural properties of FRC post [(19, 20)]. Some workers suggest that a more rigid system is advantageous as a smaller diameter of post may be used, therefore allowing a greater conservation of tooth tissue during preparation [(21)], and another study stated that fracture strength of FRC post is equivalent to conventional direct metallic post [(22)].

Fiber reinforced composite surface treatments

Surface treatments of fiber posts are considered to be a common method of improving the general adhesion properties of a material, facilitating chemical and micromechanical retention between different constituents [(23)].

Several studies used silane as a chemical surface treatment in an attempt to improve bonding of fiber post and revealed controversial results. Some studies [(6, 24)] reported an increasing effect of silanization compared to untreated controls, whereas other studies [(25, 7)] did not detect any difference between silanated and untreated control posts.

Etching is intended to create a roughening of the surface that allows for micromechanical interlocking with resinous restoration. This methodology has been recently proposed for etching glass fiber posts [(26)]. Phosphoric acid, hydrogen peroxide, and hydrofluoric acid are common materials used for conditioning fiber post surface. The acid effect was time-dependent and influenced by the post composition (type of matrix and/or fibers) [(27)]

Sandblasting is routinely applied to provide surface roughening making materials more bondable. Airborne-particle abrasion produces a roughened surface as a result of the high-speed impact of abrasive particles, enabling better interaction with the resin cement, but the roughened surface may produce surface damage which, in turn, reduces the strength of the post.

Sahafi et al. [(9)] **(2003)** determined the effect of surface treatments on bond strength of two resin cements to titanium alloy, glass fiber, and zirconia posts to dentin. The posts then received one of three surface