" قالوا سبحانك لا علم لنا الا ما علمتنا

انك أنت العليم الحكيم "

الأية ٣٢ سورة البقرة

Comparative Evaluation Of Sealing Ability and Adaptability Of Two Resin Based Root Canal Sealers Using Laser Versus Recent Irrigating Solutions As A Preconditioning Systems

(An in vitro study)

Thesis submitted to the Faculty of Oral and Dental Medicine, Cairo University, In Partial Fulfillment of the Requirements of the Master Degree in Endodontics

BY

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List of Abbreviation

CO2…….Carbon dioxide

CHX…….Chlorhexidine

Cr: YSGG ……Chromium Yttrium Scandium Gallium Garnet

CRCS…….……..Calciobiotic root canal sealer

EDTA……... Ethylene Diamine Tetra Acetic acid

EDTAC……..…. Ethylene Diamine Tetra Acetic acid Cetavlon

Er: YAG .....Erbium Yttrium Aluminum Garnet

GP……. Gutta-Percha

GT…….…….Greater Taper

H2O……Water

H2O2……..Hydrogen peroxide

He-Ne .....Helium/Neon

Ho: YAG.....Holmium Yttrium Aluminum Garnet

KTP .....Potassium Titanyl phosphate

MAF……...Master apical file

NaOCl……...Sodium hypochlorite

Nd: YAG.....Neodyrnium Yttrium Aluminum Garnet

Nd: YAP.....Neodymium Yttrium Aluminum Perovskite

PCS……..…..Pulp canal sealer

SEM……..Scanning electron microscope

UDMA……..Urethane dimethacrylate

ZOE……..Zinc-oxide-eugenol

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1-Introduction:

The long lasting seal of a root canal filling, which is of clinical importance, depend largely on the sealing and adhesive ability of the sealer used[1,2,3] .A wide variety of root canal sealers are available commercially, and they are divided into groups according to their chemical composition. There is no consensus on which materials seal most effectively [4]

Studies have shown that current methods of cleaning and shaping root canals produce a smear layer containing inorganic and organic substances, which include fragments of odontoblastic processes, microorganisms, and necrotic materials [5, 6]**.** The removal of smear layer and the presence of patent dentinal tubules has importance in decreasing the time necessary to achieve the disinfecting effect of intracanal medications[7]. The presence of a smear layer can inhibit or significantly delay penetration of antimicrobial agents, such as intracanal irrigants and medications into the dentinal tubules[8,9].

Various acids, ultrasonic instruments and lasers have been tried to remove the smear layer. Recently a product called MTAD has been suggested as a final rinse to remove the smear layer from the surface of instrumented root canals.

The possible use of laser in root canal therapy relies on the physical properties of laser radiation that enables the removal of tissue debris, microorganisms, and smear layer of the root canal. Laser characteristics include wavelength, dissipated energy, and the use of a fiberoptic technology that gives access to the root canal system[10].

Researchers seem to suggest that laser radiation may have the potential to improve endodontic treatment. Different types of lasers have been used in root canals for example, carbon dioxid laser [11], argon laser[12], Xecl excimer laser [13], Er:YAG laser [10] , Diode and Nd:YAG laser [14].

Excellent apical sealing has been found with epoxy resin-based sealers, even when used as a sole filling in a root canal [15]. The long lasting setting time and material fluidity [16], it also has the ability to solidify in a wet medium. [17] showing higher bond strength than calcium hydroxide, zinc-oxide and glass ionomer based sealers [18, 19].

AH plus root canal sealer (based on epoxy amine resin) is described as having a faster setting time, excellent sealing properties, and no longer releases toxic substance like formaldehyde [3,20].

EndoRez, is a Urethane-dimethacrylate based resin sealer, which is a hydrophilic methacrylate resin monomers that may be incorporated into the root canal sealers to facilitate better resin penetration into dentinal tubules after removal of the smear layer [21].

Therfore we have to shed a light on the new materials with different preconditioning solutions as regard to their adaptability and sealing ability to root canal dentine wall.

2-Review of Literature

A complete sealing of root canal system after cleaning and shaping is critical to successful endodontic therapy [22, 23] .The long lasting seal of a root canal filling, which is of clinical importance, depends largely on the sealing and adhesive ability of the sealer used [24, 25] .A wide variety of root canal sealers are available commercially, and they are divided into groups according to their chemical composition. There is no consensus on which materials seal most effectively [4].

The review is divided into three components:

2.1-Different Methods for Dentin preconditioning.

2.2-Adaptability and Sealability of resin based root canal sealers.

2.3-Methods of evaluation of microleakage.

2.1- Different methods for dentin preconditioning.

One of the fundamental aims of root canal treatment is to clean the root canals as thoroughly as possible to eliminate tissue debris and microorganism, removing the smear layer, opening the dentinal tubules and allowing the antibacterial agents to penetrate the entire root canal system in order that obturation succeeds successfully [26]

2.1a- Smear layer removal:

The advantages and disadvantages of the presence of the smear layer, and if it should be removed from instrumented root canals are still controversial issues. The smear layer acts as a physical barrier interfering with adhesion and penetration of sealer into dentinal tubules [27]. Previous studies [28, 29] reported that the presence or absence of smear layer had no significant effect on apical seal, whereas other investigations indicated that removal of the smear layer might improve the obturation seal [30, 31].