



" قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا

إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

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)

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# **Content**

Page

|                                                                               |            |
|-------------------------------------------------------------------------------|------------|
| <b>Content.....</b>                                                           | <b>I</b>   |
| <b>List of Abbreviation.....</b>                                              | <b>III</b> |
| <b>List of tables.....</b>                                                    | <b>IV</b>  |
| <b>List of figures.....</b>                                                   | <b>V</b>   |
| <b>1-Introduction.....</b>                                                    | <b>1</b>   |
| <b>2-Review of literature.....</b>                                            | <b>3</b>   |
| <u>2.1</u> - Different Methods for Dentin preconditioning.....                | 3          |
| 2.1a- Smear layer removal.....                                                | 3          |
| 2.1b- Preconditioning of dentin using laser.....                              | 7          |
| 2.1bi-Laser physics.....                                                      | 8          |
| 2.1bii-Laser tissue interactions.....                                         | 11         |
| 2.1b-iii-Effect of laser on root canal walls .....                            | 14         |
| 2.1c-Preconditioning of dentin using MTAD.....                                | 16         |
| 2.1d-Preconditioning of dentin using NaOCl.....                               | 20         |
| <u>2.2</u> -Adaptability and Sealability of resin based root canal sealers... | 25         |
| <u>2.3</u> -Methods of evaluation of microleakage.....                        | 41         |
| <b>3-Aim of the study .....</b>                                               | <b>45</b>  |
| <b>4-Material and Methods.....</b>                                            | <b>46</b>  |
| <u>4.1</u> -MATERIALs.....                                                    | 46         |
| <u>4.2</u> -METHODS.....                                                      | 50         |
| 4.2a- Selection of samples.....                                               | 50         |
| 4.2b- Teeth preparation.....                                                  | 50         |
| <u>4.3</u> -Classification of samples.....                                    | 51         |
| <u>4.4</u> -Dentin Preconditioning:.....                                      | 54         |
| 4.4a-Dentin preconditioning using NaOCl.....                                  | 54         |
| 4.4b-Dentin preconditioning using MTAD.....                                   | 54         |
| 4.4c- Dentin preconditioning using Laser.....                                 | 54         |
| <u>4.5</u> -Root canal obturation.....                                        | 55         |

|                                                                                              |     |
|----------------------------------------------------------------------------------------------|-----|
| 4.5a- Division B1. (Using AH plus sealer).....                                               | 55  |
| 4.5b-Division B2. (Using EndoRez sealer).....                                                | 56  |
| <u>4.6</u> - Storage Time.....                                                               | 56  |
| <u>4.7</u> -Evaluation of different lines of treatment.....                                  | 57  |
| 4.7a- Evaluation of Dentin preconditioning using Scanning<br>electron microscope (SEM).....  | 57  |
| 4.7b-Evaluation of sealing ability by Dye Penetration method...57                            |     |
| 4.7c- Evaluation of root filling adaptation using Scanning<br>electron microscope (SEM)..... | 59  |
| <b>5-Result</b> .....                                                                        | 61  |
| <u>5.1</u> -Evaluation of Dentin Preconditioning.....                                        | 61  |
| <u>5.2</u> -Results of linear dye penetration.....                                           | 66  |
| <u>5.3</u> -Results of scanning electron microscope.....                                     | 86  |
| <b>6-Discussion</b> .....                                                                    | 88  |
| <b>7-Summary</b> .....                                                                       | 96  |
| <b>8-Conclusion</b> .....,                                                                   | 99  |
| <b>9-Recommendations</b> .....                                                               | 100 |
| <b>10-References</b> .....                                                                   | 101 |
| <b>Arabic summary</b>                                                                        |     |

## **List of Abbreviation**

|                                     |                                             |
|-------------------------------------|---------------------------------------------|
| CO <sub>2</sub> .....               | 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                               |
| H <sub>2</sub> O.....               | Water                                       |
| H <sub>2</sub> O <sub>2</sub> ..... | 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.....                        | Neodymium Yttrium Aluminum Garnet           |
| Nd: YAP.....                        | Neodymium Yttrium Aluminum Perovskite       |
| PCS.....                            | Pulp canal sealer                           |
| SEM.....                            | Scanning electron microscope                |
| UDMA.....                           | Urethane dimethacrylate                     |
| ZOE.....                            | Zinc-oxide-eugenol                          |



## List of Tables

|                                                                                                                                                                                                                                | <b>Page</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Table (1):</b> root canal instruments and filling materials.....                                                                                                                                                            | 46          |
| <b>Table (2):</b> Minimum, maximum and mean of the dye leakage penetration in NaOCl, MTAD and Nd: YAG laser in <i><b>AH plus group</b></i> at a different Observation periods.....                                             | 70          |
| <b>Table (3):</b> Means, standard deviations and results of ANOVA and Tukey's tests for comparing dye leakage penetration with different Groups in <i><b>AH plus</b></i> at a different observation periods.....               | 71          |
| <b>Table (4):</b> Minimum, maximum and mean of the dye leakage penetration in NaOCl, MTAD and Nd: YAG laser in <i><b>EndoRez</b></i> group at a different observation periods.....                                             | 76          |
| <b>Table (5):</b> Means, standard deviations and results of ANOVA and Tukey's Tests for comparing dye leakage penetration with different groups in <i><b>EndoRez</b></i> at a different observation periods.....               | 77          |
| <b>Table (6):</b> Means, standard deviations and results of ANOVA and Tukey's Tests for comparing dye leakage penetration in <i><b>NaOCl</b></i> in AH plus and EndoRez groups at a different observation periods.....         | 82          |
| <b>Table (7):</b> Means, standard deviations and results of ANOVA and Tukey's Tests for comparing dye leakage penetration in <i><b>MTAD</b></i> in AH plus and EndoRez groups at a different observation periods.....          | 83          |
| <b>Table (8):</b> Means, standard deviations and results of ANOVA and Tukey's Tests for comparing dye leakage penetration in <i><b>Nd: YAG laser</b></i> in AH plus And EndoRez groups at a different observation periods..... | 84          |

## **List of Figures**

| <b>Figure</b>                                                                                                                                      | <b>Page</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Fig.(1):</b> Schematic diagram of the essential components of a laser.....                                                                      | 9           |
| <b>Fig.(2):</b> comparison of a laser and ordinary light source.....                                                                               | 10          |
| <b>Fig.(3):</b> Laser tissue interactions.....                                                                                                     | 12          |
| <b>Fig.(4):</b> A photograph of EndoRez sealer kit.....                                                                                            | 47          |
| <b>Fig.(5):</b> A photograph of AH plus sealer.....                                                                                                | 48          |
| <b>Fig.(6):</b> A photograph of BioPure MTAD root canal irrigant.....                                                                              | 48          |
| <b>Fig.(7):</b> photograph of Nd:YAG laser device.....                                                                                             | 49          |
| <b>Fig.(8):</b> Grouping of teeth.....                                                                                                             | 53          |
| <b>Fig.(9):</b> A photograph of the laser technique.irradiation of the root canal in<br>continuous circular motion from apical to coronal end..... | 55          |
| <b>Fig.(10):</b> A photograph of the stereomicroscope (Olympus- SZ-PT Japan)<br>attached by CCD digital camera (DP10, Olympus-Japan).....          | 58          |
| <b>Fig.(11):</b> A photograph of the Scanning electron microscope.....                                                                             | 59          |
| <b>Fig.(12):</b> SEM(X2500) photograph of longitudinal section of root irrigated<br>with 2.6%NaOCl.....                                            | 62          |

|                                                                                                                                                                |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Fig.(13):</b> SEM(X2500) photograph of longitudinal section of root<br>Irrigated with 2.6%NaOCl a final rinse of MTAD.....                                  | 63 |
| <b>Fig. (14).</b> SEM(X2500) photograph of longitudinal section of root irrigated<br>with 2.6%NaOCl a final rinse of MTAD.....                                 | 64 |
| <b>Fig. (15).</b> SEM(X2500) photograph of longitudinal section of root irradiated<br>Nd:YAG laser.....                                                        | 65 |
| <b>Fig.(16):</b> A photograph showing dye leakage in subgroup (I B1b).....                                                                                     | 69 |
| <b>Fig.(17):</b> A photograph showing dye leakage in subgroup (II B1b).....                                                                                    | 69 |
| <b>Fig.(18):</b> A photograph showing dye leakage in subgroup (III B1b).....                                                                                   | 70 |
| <b>Fig.(19):</b> Means of linear dye penetration in NaOCl, MTAD and Nd: YAG laser<br>in <i>AH plus</i> group at a different observation periods.....           | 72 |
| <b>Fig.(20):</b> A photograph showing dye leakage in subgroup (I B2b).....                                                                                     | 75 |
| <b>Fig.(21):</b> A photograph showing dye leakage in subgroup (II B2b).....                                                                                    | 75 |
| <b>Fig .(22):</b> A photograph showing dye leakage in subgroup (III B2b)<br>Using Nd: YAG laser for preconditioning, and EndoRez sealer for obturation.....    | 76 |
| <b>Fig.(23).</b> Means of linear dye penetration in NaOCl, MTAD and Nd:YAG laser in<br><i>EndoRez</i> group at a different observation periods.....            | 78 |
| <b>Fig .(24):</b> Means of linear dye penetration in <i>NaOCl</i> in <i>AH plus</i> and <i>EndoRez</i><br>groups at a different observation periods.....       | 82 |
| <b>Fig. (25):</b> Means of linear dye penetration in <i>MTAD</i> in <i>AH plus</i> and <i>EndoRez</i><br>groups at a different observation periods.....        | 83 |
| <b>Fig.(26):</b> Means of linear dye penetration in <i>Nd:YAG laser</i> in <i>AH plus</i> and<br><i>EndoRez</i> groups at a different observation periods..... | 84 |

|                                                                                                                                                                                           |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Fig. (27).</b> scanning-electron-photograph of subgroup( <b>B1a</b> ) showing excellent adaptation of gutta-percha to dentin.....                                                      | 86 |
| <b>Fig.(28).</b> scanning-electron-photograph of subdivision (B1a) showing excellent adaptation of gutta-percha to dentin. AH plus sealer in between the gutta-percha and the dentin..... | 86 |
| <b>Fig.(29).</b> scanning-electron-photograph of subgroup ( <b>B2a</b> ) showing good adaptation of gutta-percha to dentin.....                                                           | 87 |
| <b>Fig .(30).</b> Scanning-electron-photograph of subgroup ( <b>B1a</b> ) showing gap between the dentin and the EndoRez sealer.....                                                      | 87 |

## **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<sup>(1,2,3)</sup>. 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<sup>(4)</sup>

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<sup>(5, 6)</sup>. 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<sup>(7)</sup>. 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<sup>(8,9)</sup>.

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<sup>(10)</sup>.

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 <sup>(11)</sup>, argon laser<sup>(12)</sup>, Xecl excimer laser <sup>(13)</sup>, Er:YAG laser <sup>(10)</sup> , Diode and Nd:YAG laser <sup>(14)</sup>.

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

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 <sup>(3,20)</sup>.

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 <sup>(21)</sup>.

Therefore 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 <sup>(22, 23)</sup>. 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 <sup>(24, 25)</sup>. 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 <sup>(4)</sup>.

### **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 <sup>(26)</sup>

#### **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 <sup>(27)</sup>. Previous studies <sup>(28, 29)</sup> 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 <sup>(30, 31)</sup>.