



“Comparison of Shear Bond Strength of Composite Resin Bonded to Enamel Surface of Primary Teeth Treated with Laser versus other Etching Techniques: An *in vitro* Evaluation”

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلْ اَعْمَلُوا

فَسِيرَى اللَّهِ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ
وَسَتُرَدُّونَ إِلَىٰ عَالَمِ الْغَيْبِ وَالشَّهَادَةِ
فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ

صَدَقَ اللَّهُ الْعَظِيمُ

سورة التوبة - الآية (١٠٥)

"In the Name of God, the Most Gracious, the Most Merciful"

"And say, Do [as you will], for Allah will see your deeds, and [so, will] His Messenger and the believers. And you will be returned to the Knower of the unseen and the witnessed, and He will inform you of what you used to do."

At-Tawba(9-105)

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Dedication

This work is dedicated to:

My Family,
Husband and my little “Lilly”

*For Their endless support, supreme love, and
absolute care, it's you who I owe anything
I have become or will be*

LIST OF CONTENTS

| | <i>Page</i> |
|--------------------------------------|-------------|
| LIST OF ABBREVIATIONS..... | II |
| LIST OF FIGURES | III |
| LIST OF TABLES | VI |
| INTRODUCTION..... | 1 |
| REVIEW OF LITERATURE | 3 |
| AIM OF THE STUDY | 22 |
| MATERIALS & METHODS..... | 23 |
| RESULTS..... | 37 |
| DISCUSSION | 50 |
| SUMMARY | 57 |
| CONCLUSION..... | 59 |
| CLINICAL RECOMMENDATIONS..... | 60 |
| REFERENCES | 61 |
| ARABIC SUMMARY | - |

LIST OF ABBREVIATIONS

| Abbreviation | Meaning |
|---------------------|---|
| GIC's | Glass Ionomer Cements |
| RMGI | Resin Modified Glass Ionomer |
| ART | Atraumatic/Alternative Restorative technique |
| Bis-GMA | Bisphenol A-Glycidylmethacrylate |
| Mpa | Megapascal |
| HEMA | 2-Hydroxy-ethyl Methacrylate |
| HL | Hybrid Layer |
| SEA | Self-etch adhesive |
| EP | Self-etch primer |
| SE | Self-etch |
| ER | Etch-and-rinse |
| Laser | Light Amplification By Stimulated Emission Of Radiation |
| CO2 | Carbon Dioxide |
| Er | Erbium |
| Nd | Neodymium |
| YAG | Yttrium, Aluminum, Gallium, Garnet |
| YSGG | Yttrium, Scandium, Gallium, Garnet |
| Er,Cr:YSGG | Erbium, Chromium-doped Yttrium Scandium Gallium Garnet |

LIST OF FIGURES

| Figure no. | Title | Page |
|-------------------|---|-------------|
| 1 | Classification of laser according to active medium..... | 18 |
| 2 | Classification of laser according to wave length..... | 18 |
| 3 | Specimen Grouping | 25 |
| 4 | Ultra-sonic scaler..... | 26 |
| 5 | Diamond disc and straight hand piece | 27 |
| 6 | Sectioned tooth | 27 |
| 7 | Sectioned tooth embedded in self-cured acrylic resin placed in polyvinyl ring..... | 27 |
| 8 | Sectioned tooth after flattening and smoothened using a 300 and a 600 grit sandpaper abrasive paper | 28 |
| 9 | Application of 37% phosphoric acid etchant | 29 |
| 10 | Application of the adhesive to the etched enamel surface ... | 30 |
| 11 | Application of universal adhesive in self-etch mode to flattened enamel surface | 30 |
| 12 | Parameters set for laser etching..... | 31 |
| 13 | Er,Cr.YSGG laser machine | 31 |
| 14 | Laser application, in a non-contact mode with a distance of 2mm from the enamel surface at an angle 45° | 32 |
| 15 | Mz8 tip | 32 |
| 16 | Gold hand piece..... | 33 |
| 17 | Laser etched enamel | 33 |

| Figure no. | Title | Page |
|-------------------|--|-------------|
| 18 | Tygon™ catheters 2*2 mm fitted in place | 34 |
| 19 | Composite Packed inside the tube..... | 35 |
| 20 | Removal of the Tygon catheters..... | 35 |
| 21 | Universal testing machine | 36 |
| 22 | Chissel applying load to the specimen at the composite enamel interface | 36 |
| 23 | Boxplot representing median and range values for shear bond strength in the five groups | 39 |
| 24 | Boxplot representing median and range values for shear bond strengths of Group I and Group II | 40 |
| 25 | Boxplot representing median and range values for shear bond strengths of Group I and Group III (Circle represents outlier) | 41 |
| 26 | Boxplot representing median and range values for shear bond strengths of Group I and Group IV (Circle represents outlier) | 42 |
| 27 | Boxplot representing median and range values for shear bond strengths of Group I and Group V (Circle represents outlier) | 43 |
| 28 | Boxplot representing median and range values for shear bond strengths of Group II and Group III | 44 |
| 29 | Boxplot representing median and range values for shear bond strengths of Group II and Group IV | 45 |
| 30 | Boxplot representing median and range values for shear bond strengths of Group II and Group V | 46 |
| 31 | Boxplot representing median and range values for shear bond strengths of Group III and Group IV | 47 |

| Figure no. | Title | Page |
|-----------------------|--|-------------|
| 32 | Boxplot representing median and range values for shear bond strengths of Group III and Group V | 48 |
| 33 | Boxplot representing median and range values for shear bond strengths of Group IV and Group V | 49 |

LIST OF TABLES

| Table No. | Title | Page |
|------------------|---|-------------|
| 1 | List of materials used | 24 |
| 2 | Descriptive statistics and result of Kruskal-Wallis test for comparing the shear bond strength in the five test groups ... | 38 |
| 3 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group I and Group II..... | 40 |
| 4 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group I and Group III | 41 |
| 5 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group I and Group IV | 42 |
| 6 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group I and Group V | 43 |
| 7 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group II and Group III..... | 44 |
| 8 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group II and Group IV..... | 45 |
| 9 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group II and Group V | 46 |
| 10 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group III and Group IV | 47 |

| Table No. | Title | Page |
|------------------|---|-------------|
| 11 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group III and Group V..... | 48 |
| 12 | Descriptive statistics and result of Dunn's test for pair-wise comparison of shear bond strength between Group IV and Group V..... | 49 |

INTRODUCTION

Dental caries is one of the most prevalent childhood diseases worldwide, even though it is largely preventable. Cavitations occur as a result of a complex interaction between acid-producing bacteria and fermentable carbohydrates, resulting in demineralisation of inorganic component and dissolution of organic structure of the tooth, compromising the overall structure of tooth¹. The lack of treatment of dental caries leads to pain, repeated prescription of antibiotics, tooth loss, malnutrition, poor childhood development, low self-esteem, and missed school days, which renders it a serious public health problem². Leading to a compromise in the child's overall quality of life. Also, it has been acknowledged that decay in primary teeth is a strong risk factor of dental caries in the permanent teeth³.

In children, primary teeth play a vital role for eating, phonetics, esthetics and also act as a space maintainer for permanent teeth. Hence primary teeth are a valuable asset of a child. Often problems in primary teeth in the form of pain and swelling can cause distress to the child, leading to inability to chew or speak properly or even may affect the appearance of a child⁴. Thus restoration of any carious teeth is mandatory. One of the most common procedures performed by dentists is dental restorations, or their replacement. There are several different options of materials used in pediatric dentistry to restore decayed primary teeth, including composites, glass ionomer cements, or steel crowns⁵.

Adhesive resin composites have become an important material of choice in the restoration of primary teeth as well as permanent teeth nowadays, Composite resins are not only aesthetic but also the cavity

preparation is a non-invasive procedure to the tooth structures. The adhesion of resin to enamel is based on micromechanical retention to roughened conditioned surfaces⁶. This point is particularly problematic when it comes to primary teeth. The bond strength of composite to enamel of primary teeth is less than that of permanent teeth due to their inherent morphological and physiological differences⁷. Several factors can affect the bond strength of composite to tooth structure one of them is the adhesive system used⁸.

“Prevention of extension” has now replaced the old concept of “Extension for prevention”. It is important to be open to new technology, by being more creative in terms of technology, or by modifying and improving existing ones⁹. Resin adhesive systems have many commercial names nowadays, which makes it very challenging to the dentist to catch out with all the new innovations in material science and to choose the best for their clinics¹⁰.

The presences of alternative methods of enamel conditioning and increasing its surface energy of have been the research focus for the past years. One of these innovations is the use of laser irradiations. It has been found that enamel surfaces prepared by erbium lasers have shown similar etching patterns as those produced by acid etching¹¹. There has been a growing research interest on the conditioning effect of ER:Cr.YSGG laser on enamel and how it will affect the bond strength of composite resin to the tooth surface¹¹. However, the effect of various etching modalities including laser irradiation on the bond strength of composite to primary enamel is still not available.

Thus this study was performed to compare the shear bond strength of composite resin bonded to enamel of primary teeth using ER:Cr.YSGG laser pretreatment versus other etching modalities.