“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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بسم الله الرحمن الرحيم

وقل اعملوا

فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ

فَيُنَبِّئُكُم بِمَا كُنتُمْ تَعْمَلُونَ

صدق الله العظيم

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

LIST OF ABBREVIATIONS

Abbreviation	Meaning
GIC's	Glass Ionomer Cements
RMGI	Resin Modified Glass Ionomer
ART	Atraumatic/Alternative Restorative technique
Bis-GMA	Bisphenol A-Glycidyldimethacrylate
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	Neodynium
YAG	Yttrium, Aluminum, Gallium, Garnet
YSGG	Yttrium, Scandium, Gallium, Garnet
Er,Cr:YSGG	Erbium, Chromium-dopped Yttrium Scandium Gallium Garnet

LIST OF FIGURES

LIST OF TABLES

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 tooth[1]. 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 problem[2]. 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 teeth[3].

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 child[4]. 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 crowns[5].

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 surfaces[6]. 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 differences[7]. Several factors can affect the bond strength of composite to tooth structure one of them is the adhesive system used[8].

"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 ones[9]. 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 clinics[10].

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 etching[11]. 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 surface[11]. 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.