



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغييرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



MONA MAGHRABY



“Efficiency of Er, Cr:YSGG laser in laminate veneers debonding on two ceramic materials and resin cement”

-An in vitro study-

Thesis

***Submitted to the Faculty of Dentistry - Ain Shams University
for Partial Fulfillment of the Requirements for Master's Degree in
Fixed Prosthodontics***

By

Ahmed Ibrahim Youssef

B.D.S., Faculty of Dentistry, Misr International University, (2009)

TA, Misr International University

**Faculty of Dentistry
Ain Shams University
2021**

SUPERVISORS

Dr. Marwa Mohamed Wahsh

Professor of Fixed Prosthodontics,
Fixed Prosthodontics Department,
Faculty of Dentistry, Ain Shams University

Prof. Norbert Gutknecht

Department Director of the Department of Restorative Dentistry,
Director of the Aachen Dental Laser Center,
Scientific Director of Academic Postgraduate Master Program
"Master of Science – Laser in Dentistry at the RWTH Aachen University

Dr. Ghada Abd El Fattah Abd El Sattar

Associate Professor of Fixed Prosthodontics,
Fixed prosthodontics Department,
Faculty of Dentistry, Ain Shams University

Dr. Talaat Mohamed Samhan

Lecturer of Fixed Prosthodontics,
Fixed prosthodontics Department,
Faculty of Dentistry, Misr International University

Acknowledgment

In the name of **Allah**, the Most Gracious and the Most Merciful Alhamdulillah, all praises to Allah for the strengths and His blessing in completing this thesis

It's a great honor to express my sincere gratitude and appreciation to my Advisor **Dr. Marwa Mohamed Wahsh**, Professor of Fixed Prosthodontics, Faculty of Dentistry, Ain Shams University for her guidance, expert assistance and powerful support.

I am highly thankful to **Prof. Norbert Gutknecht** the Department Director of restorative dentistry, director of the Aachen dental laser center, scientific director of academic postgraduate master program "master of science – laser in dentistry at the RWTH Aachen University for his immense knowledge, continuous motivation, friendly advice and kind support. Without his help, this work, would have never been possible

I am greatly thankful for my Advisor **Dr. Ghada Abd El Fattah** Associate Professor of Fixed Prosthodontics, Faculty of Dentistry, Ain Shams University for her encouragement, patience and support during the work.

I am also sincere thankful for **Dr. Talaat Mohamed** lecturer of Fixed Prosthodontics, Faculty of Dentistry, International University for his encouragement, patience and support during the work.

A special gratitude goes to the department of Fixed Prosthodontics. Misr International University.

Dedication

To My Happily Ever After

My Family

My Greatest Supporter my mother
Dr. Afaf Hamdy

My Dad
Prof Dr. Ibrahim Youssef

My Sisters, Wife & Daughter

My Friends who encouraged, support me and
who continually stood by me

LIST OF CONTENTS

Page

LIST OF TABLES	
LIST OF FIGURES	
INTRODUCTION.....	
REVIEW OF LITERATURE	
STATEMENT OF PROBLEM	
AIM OF THE STUDY	
MATERIALS and METHODS.....	
HYPOTHESIS.....	
RESULTS.....	
DISCUSSION	
SUMMARY.....	
CONCLUSION.....	
RECOMMENDATIONS	
REFERENCES	
ARABIC SUMMARY.....	-

LIST OF TABLES

Table No.	Title	Page
1	The ceramic blocks in the study	31
2	Mechanical properties of IPS E.max lithium disilicate	32
3	Mechanical properties of Vita Mark II.....	33
4	Resin-based luting agents used in the study	33
5	Materials used in Ceramic Discs and Tooth Preparation ...	35
6	Experimental factorial design.....	38
7	Parameters used in crystallization of ceramic discs	40
8	WaterLase parameters for debonding procedures	45
9	The median, range values and results of Mann-Whitney U test for comparisons between the two ceramics and Kruskal-Wallis test for the effect of curing on surface roughness (Ra).....	51
10	Frequencies, percentages and results of Fisher's Exact test for comparison between failure modes in different groups.....	56
11	The mean, standard deviation (SD), 95% Confidence Interval (95%CI) values and results of Student's t-test for comparison between debonding times (Seconds) in the two groups	60
12	The mean, standard deviation (SD) values and results of Kruskal-Wallis test for comparison between atomic weight % of different elements in the different groups.....	64
13	Three-way ANOVA results for the effect of different variables on mean shear bond strength in Mpa	66

Table No.	Title	Page
14	The mean, standard deviation (SD) values and results of three-way ANOVA test for comparison between shear bond strength after rebonding regardless of ceramic and curing.....	67
15	The mean, standard deviation (SD) values and results of three-way ANOVA test for comparison between shear bond strength of two ceramics regardless of curing and rebonding.....	68
16	The mean, standard deviation (SD) values and results of three-way ANOVA test for comparison between shear bond strength of the two curing modes regardless of ceramic and rebonding..	69
17	The mean, standard deviation (SD) values and results of three-way ANOVA test for comparison between shear bond strength values with different interactions of variables.	72

LIST OF FIGURES

Figure no.	Title	Page
1	IPS EMAX CAD/CAM Ceramic Blocks (shade A1LT).....	32
2	Vita Mark II CAD/CAM Ceramic Blocks (shade 1M1CI14)	32
3	Dual-Polymerizing Resin Cement (RelyX Ultimate Clicker).....	34
4	Light-polymerizing Resin Cement (RelyX Veneer)	34
5	Hydrofluoric acid 9% & Silane coupling agent	36
6	Phosphoric acid etch 37%	36
7	Phosphoric acid tip applicator	36
8	Total Etch Adhesive	36
9	Isomet diamond saw 4000, Buehler, USA	39
10	Cutting lithium disilicate blocks.....	39
11	Cutting vita mark II blocks.....	39
12	Thickness 0.7mm using Horex digital caliper, Hoffmann Group, Germany.....	39
13	Furnace EP3010 programat, Ivoclar Vivadent, Schaan, Liechtenstein	40
14	Ceramic discs after crystallization	40
15	Bovine teeth fixed in color coded acrylic molds.....	41
16	Cold cure acrylic resin, Acrostone Dental & Medical Supplies, Egypt.....	41
17	Customized paralleling device assembly for preparation standardization.....	42

Figure no.	Title	Page
18	Phosphoric acid application.....	42
19	Showing HF acid application	43
20	Air and water spray rinsing	43
21	Ceramic disc placement in position.....	43
22	Light cure activation.....	43
23	Light cure device used	44
24	Er,Cr:YSGG with turbo hand piece	46
25	Custom made positioner to fix distance between ceramic sample and handpiece , and showing laser beam indicator after positioner attaching	46
26	Scan electron microscope unit.....	47
27	K550X sputter coater, England.....	48
28	Discs after gold sputting.	48
29	Instron Machine.....	49
30	Numbering of acrylic Blocks	49
31	Shearing blade positioned	49
32	Box plot representing median and range values of surface roughness (Ra) in the different groups (Circle represents outlier)	52
33	SEM IPS E.max CAD evaluation at baseline with two magnifications	53
34	SEM VITA MARK II evaluation at baseline with two magnifications	53

Figure no.	Title	Page
35	IPS Emax CAD cemented by Light cure resin cement evaluation after laser debonding procedures.....	54
36	IPS Emax CAD cemented by Dual cure resin cement evaluation after laser debonding procedures.....	54
37	VITA MARK II cemented by Light cure resin cement evaluation after laser debonding procedures.....	54
38	VITA MARK II cemented by Dual cure resin cement evaluation after laser debonding procedures.....	55
39	Bar chart representing failure modes of the different groups.....	57
40	IPS E max CAD cemented by light Cured Resin Cement, Failure mode evaluation (500 X) after laser debonding.	57
41	IPS Emax CAD cemented by Dual Cured Resin Cement, Failure Mode Evaluation after Laser Debonding...	58
42	VITA MARK II Cemented Light Cure Resin Cement, Failure Mode Evaluation after laser debonding.	58
43	VITA MARK II Cemented by Dual Cure Resin Cement, Failure Mode Evaluation after laser debonding	59
44	Bar chart representing the mean and standard deviation values of debonding times of two ceramics.	60
45	Bar chart representing mean and standard deviation values of atomic % for different elements in the studied groups	65
46	Bar chart representing the mean and standard deviation values for shear bond strength of control and rebounded specimens regardless of ceramic and curing.....	67
47	Bar chart representing the mean and standard deviation values for shear bond strength of two ceramics regardless of curing	68

Figure no.	Title	Page
	and rebonding	
48	Bar chart representing the mean and standard deviation values for shear bond strength of the two curing modes regardless of ceramic and rebonding.	69
49	Bar chart representing the mean and standard deviation values for shear bond strength with different interactions of variables. ...	73

INTRODUCTION

The Smile was found to be one of the first traits that get recognized during interpersonal interactions, where a beautiful smile was valued as high self-esteem. Dentistry has changed dramatically over the past decades, from just the meaning of treating the pain of dental disease to accomplishing the optimal standards of beauty. With the influence of the media that people get exposed to frequently now days, dental esthetics has become a challenge^[1, 2].

Nowadays, different cosmetic restoration materials can be used in the dental field, these materials can be used directly or indirectly. The most popular restorative material is the porcelain laminate veneers, which has various advantages for its ability to bond to the tooth structure, low occlusal wear of opposing teeth and on top of that its esthetic characterization, especially when done with layering technique^[3].

The microstructure of ceramics determines the optical and mechanical properties of the restoration. As the glass content increases, superior esthetics gained but low mechanical properties and vice versa, to combine both strength and esthetic properties, layering technique is done using a high-strength core veneered with translucent porcelain, monolithic restorations fabricated by CAD/CAM in case of Feldspathic porcelain and lithium disilicate or monolithic lithium disilicate fabricated by heat-pressed technology have been suggested^[4].

Materials frequently used for laminate veneers include lithium disilicate and feldspathic porcelain those types of veneers offer numerous benefits and features, lithium disilicate and Feldspathic veneers are mainly using CAD/CAM technology that makes them highly durable. Moreover,