

## A Comparative Analysis of CAD/CAM Endocrown Materials, and Indirect Composite Restorations in Pulpotomized 1ry Molars: An In Vitro Study"

#### **Thesis**

Submitted to the Department of Pediatric Dentistry and Dental Public Health

Faculty of Dentistry - Ain Shams University

In Partial fulfillment of the requirements of the Master Degree in **Pediatric Dentistry** 

By

#### Islam Yehia Zakaria El Guindy

B.D.S, Faculty of Dentistry,
Ain Shams University 2011.

Teaching Assistant - Pediatric Dentistry Dept.
British University in Egypt

Faculty of Dentistry Ain Shams University 2019

### **SUPERVISORS**

#### Dr. Noha Samir Kabil

Professor of Pediatric Dentistry and Dental Public Health
Faculty of Dentistry
Ain Shams University

#### Dr. Ola Abd El Gelel

Lecturer of Pediatric Dentistry and Dental Public Health
Faculty of Dentistry
Ain Shams University

### **Dr. Maged Mohamed Zohdy**

Associate Professor of Fixed Prosthodontics

Faculty of Dentistry

Ain Shams University

## "بسم الله الرحمن الرحيم"]

"وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ ۚ وَسَتُرَدُّونَ إِلَىٰ عَالِمِ اللَّهُ وَالْمُؤْمِنُونَ ۚ وَسَتُرَدُّونَ إِلَىٰ عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُم بِمَا كُنتُمْ تَعْمَلُونَ"

## صدق الله العظيم""

"سورة التوبة" (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)** 

# Acknowledgement

First and foremost, thanks are due to Allah the Beneficent and Merciful.

My deepest appreciation goes to my Mentor *Professor Dr. Noha Samir Kabil*, Professor of Pediatric Dentistry, Dental Public Health and Community Dentistry, Faculty of Dentistry, Ain Shams University, for her continuous guidance and support and for always backing me up & believing in my abilities when I needed it the most.

I would also like to express my sincere appreciation and thanks to *Dr. Ola Abd El Gelel* Lecturer of Pediatric Dentistry, Dental Public Health and Community Dentistry, and *Dr. Maged Mohamed Zohdy* Associate professor of Fixed Prosthodontics, Faculty of Dentistry Ain Shams University for their valuable input, time and all what they have taught me throughout the writing process, and clinical procedures.

I would also like to deeply thank my dear professors, colleagues and staff members of Pediatric Dentistry, Dental Public Health and Community Department, Faculty of Dentistry, Ain Shams University, for their great support, and cooperation throughout my journey in the Department.

I cannot miss the opportunity to thank my Professors and Colleagues at the Faculty of Dentistry British University in Egypt, led by my dear **Dr. Nadia Metwally** Professor of Pediatric Dentistry, Dental Public Health and Community Dentistry, for their extreme help and support, and for providing the best work environment there could be.

Last but not least I would like to thank my friends Dr. Sara Magdy, Dr. Islam Heiba and Dr. Doaa Taha for their great efforts and contributions to this research.

# Dedication

This work is dedicated to:

# My Father, My Mother

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

# My Brother, Sister

For their continuous support and love.

## TABLE OF CONTENTS

	Page
List of Figures	II
List of Tables	V
List of Abbreviations	VI
Introduction	1
Review of Literature	4
Aim of the study	20
Materials and Methods	21
Results	66
Discussion	70
Summary	80
Conclusions	84
Clinical Recommendations	85
References	86
Arabic Summary	-

### LIST OF FIGURES

Figure	TP:41	
no.	Title	Page
1	Vita Enamic Block	22
2	Filtek Z-250 Composite Resin	22
3	TelioCAD blocks	23
4	Breeze self-adhesive resin cement	23
5	Porcelain Etchant	24
6	Ultradent Porcelain Silane	24
7	ONE Coat self-etchant adhesive	25
8	37% phosphoric acid etch any etch	25
9	Zinc Oxide Eugenol Powder & Liquid (I Zoe)	26
10	Reinforced Glass Ionomer Equia Capsules	26
11	The collected teeth for the experiment	28
12a	Digital Caliber	29
<b>12b</b>	Digital Caliber measuring Buccolingual Dimension	29
12c	Measuring the Mesiodistal Dimension	29
13a	Mounting Surveyor, Tooth specimen fixed by sticky wax to the moving rod	30
13b	Mounting Surveyor, Placing the tooth specimen into epoxy acrylic resin	30
14a	Access cavity preparation done	31
14b	Obturation by zinc oxide eugenol paste leaving only plugs in the orifices	31
15	Glass Ionomer placement as a base to seal undercuts and isolate zinc oxide eugenol	32
16a	Straight Hand piece mounted on surveyor	33
16b	Occlusal reduction	34
16c	Axial preparation	34

Figure	T:41a	Dogo
no.	Title	Page
17a	Administration phase	37
17b	Selecting type of restoration inlay/onlay	37
18a	Selection of material: Vita Enamic	38
18b	Selection of material: Teliocad	38
19a	Scanning phase	39
19b	3D Virtual Model	39
20a	Model phase	41
<b>20b</b>	Model phase: Adjusting restoration parameters	41
21a	Design phase - proposed design	42
21b	Adjusting the restoration position within block	42
22a	Step Bur 12 S	43
<b>22b</b>	Cylinder pointed Bur 12 S	43
23a	Milling Phase: block secured in Cerec machine ready for milling	44
23b	Milling phase: screen showing milling progress	44
23c	Milling phase: MC XL Unit	44
24	Impressions and poured stone models	46
25	Finishing tools for indirect composite Endocrowns	47
26	Impression, specimens, and endocrowns on stone models	47
27	Specimens from the 3 groups with their corresponding finished endocrown restorations	48
28	Vita Enamic Endocrown	49
29	Teliocad Endocrown	49
30	Indirect composite Endocrown	49
31a	Acid etching the enamel surface	50
31b	Bond application	50
32	Hydrofluoric acid etching of the restorations fitting surface	51

Figure	Title	Dogo
no.	Title	Page
33	Priming; Silane coupling agent application	52
34	Resin cement Application and light Curing	53
35	Light Microscope with modifications to provide external light source	55
36a	Graduated ruler used as Reference scale	56
36b	Measuring marginal gap between tooth surface and restoration surface on Digimizer software	56
37a	Vita enamic endocrown Pre Cementation	57
37b	Vita Enamic endocrown Post Cementation	57
38a	PMMA Group Pre cementation	58
38b	PMMA Group Post cementation	58
39a	Indirect composite group Pre cementation	59
39b	Indirect composite group Post cementation	59
40	Universal Testing Machines	60
41	Stainless steel ball falling with thrust speed till sudden drop in the Specimen's resistance	61
42	Vita Eanmic endocrown Restorations After fracture Resistance test	62
43	Telio CAD endocrown Restorations after fracture Resistance test	63
44	Indirect composite Endocrown restorations after fracture Resistance test	64
45	The effect of cementation on marginal adaptation of each endocrown material	67
46	The effect of endocrown material on marginal adaptation before and after cementation	68
47	The effect of endocrown material on fracture resistance (N)	69