

Evaluation of color reproduction and translucency of different thicknesses of three newly introduced esthetic dental materials

Thesis

*Submitted for the partial fulfillment of the Master Degree requirements
in Crown and Bridge Department,*

Faculty of Dentistry, Ain Shams University

By

Iman Moheb Ibrahim Louis

B.D.S

Faculty of Dentistry, Ain Shams University, 2010

2015

Supervisors

Dr. Amina Mohamed Hamdy

Professor of Fixed Prosthodontics

Faculty of Dentistry, Ain Shams University

Dr. Maged Mohamed Zohdy

Lecturer of Fixed Prosthodontics

Crown and Bridge Department

Faculty of Dentistry, Ain Shams University

Dedication

I lovingly dedicate this thesis to

My Dear Parents

Mohel Ibrahim &

Melly Elmassry

For their endless

Love, Support and

Encouragement

Acknowledgment

First of all, I would like to thank **God** for this accomplishment.

My deepest appreciation and gratitude to my supervisor **Dr. Amina Mohamed Hamdy**, Professor of Crown and Bridge Department, Faculty of Dentistry, Ain Shams University, for all I have learned from her and for her continuous guidance and support.

I am grateful for the patience and assistance provided by **Dr. Maged Mohamed Zohdy**, Lecturer at Crown and Bridge Department, Faculty of Dentistry, Ain Shams University, and for his appreciated advice.

I would like to extend my appreciation and respect to **Dr. Tarek Salah Morsi**, Associate Professor and Head of Crown and Bridge Department, Faculty of Dentistry, Ain Shams University, and I owe him many thanks for his great encouragement throughout this project.

Last but not least, I wish to express my sincere thanks to all my colleagues and staff members. Special thanks should be given to **Dr. Ahmed Sabet**, Lecturer at Crown and Bridge Department, **Dr. Kamal Ebeid** and **Dr. Ahmed Mohsen** for their helpful and valuable contribution

Contents

List of tables	VIII
List of figures	X
Introduction	13
Review of Literature.....	15
1. Color	15
1.1. Color reproduction.....	17
2. Translucency	24
3. Effect of thickness on final color and translucency.....	29
4. Esthetic dental materials	34
4.1. Hybrid ceramic (VITA ENAMIC)	35
4.2. Resin nano-ceramic (LAVA ULTIMATE).....	37
4.3. Zirconia reinforced lithium silicate (VITA SUPRINITY)	39
5. Aging	40
5.1. Thermocycling	40
5.2. Accelerated aging	42
Statement of the problem	45
Aim of the study	46
Materials and Methods	47
1. Materials	47
1.1. Hybrid ceramic:.....	48

1.2.	Resin nano-ceramic:.....	50
1.3.	Zirconia reinforced lithium silicate:.....	51
1.4.	Translucent resin cement:	52
1.5.	Ceramic etch:.....	53
1.6.	Silane:	53
2.	Methods:	54
2.1.	Color evaluation	58
2.2.	Translucency evaluation.....	59
2.3.	Evaluation of the cement effect.....	61
2.4.	Evaluation of the thermocycling effect	68
3.	Statistical analysis	69
	Results.....	70
1.	Results of color	70
1.1.	Interaction between all three variants.....	71
1.2.	Effect of thickness on color disregarding material, cementation and aging	73
1.3.	Effect of material on color disregarding the thickness, cementation and aging	74
1.4.	Effect of cementation and aging on color disregarding material and thickness	75
1.5.	Effect of aging on color disregarding material, thickness and cementation.....	76
1.6.	Interaction between material and thickness	77
1.7.	Interaction between thickness, cementation and aging for each material separately.....	79
a.	Enamic.....	79
b.	Suprinity.....	81
c.	Lava Ultimate	83

1.8.	Interaction between material, cementation and aging	85
2.	Results of translucency.....	86
2.1.	Effect of material on the contrast ratio disregarding the thickness.....	87
2.2.	Effect of thickness on contrast ratio disregarding the material.....	88
2.3.	Interaction between material and thickness:	89
	Discussion.....	91
	Summary	103
	Conclusion	108
	References.....	109

List of tables

Table 1 Materials used in the study	47
<i>Table 2 Composition of the ceramic part (86 wt% / 75 vol%) of Vita Enamic</i>	48
Table 3: Technical data of Vita Enamic blocks:	49
Table 4: Technical data of Lava Ultimate:	50
Table 5 Composition of Vita Suprinity	52
Table 6 Technical data of Vita Suprinity	52
Table 7: Experimental factorial design:	55
Table 8 Interaction between different materials, thickness, cementation and aging:	71
Table 9 Effect of thickness on the color disregarding all other variables:	73
Table 10 Effect of material on color	74
Table 11 Effect of cementation and aging on color	75
Table 12 Interaction between material and thickness disregarding cementation and aging:	77
Table 13 Interaction between Enamic, thickness, cementation and aging	79

Table 14 Interaction between Suprinity, thickness, cementation and aging.....	81
Table 15 Interaction between Lava Ultimate, thickness, cementation and aging.....	83
Table 16 Interaction between material, cementation and aging	85
Table 17 Effect of material on the contrast ratio	87
Table 18 Effect of thickness on contrast ratio	88
Table 19 Interaction between material and thickness	89

List of figures

fig 1 Vita Enamic blocks.....	48
fig 2 Lava Ultimate blocks.....	50
fig 3 Vita Suprinity blocks	51
fig 4 Rely X Ultimate automix syringes translucent shade	52
fig 5 Vita ceramics etch 6 ml bottle	53
fig 6 Vitasil syringe 3 ml.....	54
fig 7 Square shaped specimens, Vita Enamic the upper row, Vita Suprinity the middle row and Lava Ultimate the lower row, with their three thicknesses 0.4 mm the first column from the right, 0.7 mm the middle and 1 mm the last column.	57
fig 8 Sawing machine	56
fig 9 Grinder-Polisher machine	56
fig 10 Electronic digital caliper	57
fig 11 Vita Easyshade Advance 4.0	60
fig 12 Color measurement with Vita Easyshade Advance 4.0 on a white background.....	60
fig 13 Color measurement with Vita Easyshade Advance 4.0 on a black backgrounds.	60

fig 14 Etch application	61
fig 15 Water spray.....	62
fig 16 Air drying	62
fig 17 Silane application.....	63
fig 18 Cement application.....	64
fig 19 Cementation.....	65
fig 20 Three stoppers ring shaped (1.5, 1.8 and 2.1mm) from right to left.	64
fig 21 Glass slab application.....	66
fig 22 Load application (200 g)	66
fig 23 Light curing.....	67
fig 24 Thermocycling machine (5-55°C dwell time 30 sec)	68
fig 25 Bar chart representing interaction between different materials, thickness, cementation and aging.....	73
fig 26 Bar chart representing effect of thickness disregarding material, cementation and aging.....	74
fig 27 Bar chart representing effect of material on color disregarding thickness, cementation and aging.....	75
fig 28 Bar chart representing effect of cementation and aging on color disregarding material and thickness	76