

تأثير اختلاف خط الحافة وطريقة التصنيع على التطابق الحافي ومقاومة الكسر للتيجان الخزفية

رسالة

مقدمة الى كلية طب الفم و الأسنان
جامعة القاهرة – توطئه للحصول على درجة الماجستير
في
الاستعاضات السنية المثبتة

مي صلاح مصطفى سليمان
(٢٠٠٥)
جامعة القاهرة

كلية طب الفم و الأسنان
جامعة القاهرة
(٢٠١٠)

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Supervisors

Dr. Omaila El-Mahallawi

***Professor of Fixed Prosthodontics,
Faculty of Oral and Dental Medicine,
Cairo University.***

Dr. Lamiaa Sayed Khairallah

***Assistant Professor of Fixed
Prosthodontics, Faculty of Oral and
Dental Medicine, Cairo University.***

Contents

	Page
Acknowledgement	i
Dedication	ii
List of Figures	iii
List of Tables	iv
Introduction	1
Review of Literature	3
Aim of the study.....	41
Materials and Methods	42
Results	94
Discussion	114
Summary and Conclusion	126
References	129
Arabic Summary	1

Acknowledgement

*First of all, I feel thankful to **Allah** for giving me the guidance and internal support in all my life and in every step that I made until this study was completed.*

*I would like to express my deep appreciation to **Dr. Omaima El Mahallawi** Professor of Fixed Prosthodontics, Faculty of Oral and Dental Medicine, Cairo University, for her valuable ideas, stimulating discussion, enlightening guidance, and keen supervision that she has kindly given to me throughout the research program, which was instrumental in achieving the completion of this study.*

*I would like to express my heartfelt thanks and deep gratitude to **Dr. Lamiaa Sayed Khairalla** Assistant Professor of Fixed Prosthodontics, Faculty of Oral and Dental Medicine, Cairo University, for her unforgettable help, advice, wise guidance, and fruitful assistance during the course of this research.*

*Also I would like to express my deep appreciation to **Dr. Magid Amin** Professor and Dean of faculty of Dentistry,*

MSA University, for his unforgettable help, encouragement and support in the completion of this study.

Also I would like to express my appreciation to Dr. Sherif El Degwi, Vice-president, MSA University, for his encouragement and support in the completion of this study.

I would like to express my heartfelt thanks and deep gratitude to Dr. Mokhtar Mamdouh Abd El Latief Vice dean of faculty of Dentistry, MSA University, for his fruitful assistance and support until the study is completed.

Also I would like to thank Dr. Atef Shaker Assistant Professor of Fixed Prosthodontics, Faculty of Oral and Dental Medicine, Cairo University, for his valuable help in preparation of the samples.

Last but not least, I would like to thank all my colleges in Fixed Prosthodontics department in MSA University for their valuable support throughout the research program.

Dedication

*I could never be grateful enough to my husband **Officer Eng. Mohamed Sobhi**, for standing beside me all over the way and for being the reason of each and every step forward in my life, **My Father** who taught me everything in my life, and last but not least **My Mother** who supported me through the whole work and get worried till it came out to the light.*

List of Figures

	Page
(Figure 1): The milling machine.....	46
(Figure 2): The three-jaw chuck of a lathe.....	46
(Figure 3): Die prepared to be conical in shape.....	47
(Figure 4): Die prepared to be with a flat occlusal table.....	47
(Figure 5): An anti-rotational groove was done in the die.....	48
Figure 6): Counter split die.....	48
(Figure 7): Application of the die spacer.....	50
(Figure 8): Non-anatomical wax pattern made by the aid of the counter die.....	50
(Figure 9): Sprueing of the wax pattern.....	51
(Figure 10): Accurate position of the wax pattern in the IPS ring gauge.....	51
(Figure 11): IPS Empress 2 special investment material.....	53
(Figure 12): Wrapping the paper ring.....	53
(Figure 13a): The paper ring set on the base of the investment ring and checked for correct fit, then the ring stabilizer was used to stabilize the paper ring...	54
(Figure 13b): Top view of sprued wax copings.....	54
(Figure 14): Whip Mix Vacuum power mixer.....	55

(Figure 15): Filling the paper ring with IPS Empress 2 Special Investment material.....	55
(Figure 16): Removing the stabilizing ring and placing the ring gauge on the investment ring.....	57
(Figure 17): Removing rough spots on the bottom surface of the investment ring with a plaster knife.....	57
(Figure 18a): Ingot support and AlOx plunger.....	58
(Figure 18b): Placement of the investment ring and the AlOx plunger in the preheating furnace.....	58
(Figure 19): Burnout furnace (Vulcan-Degussa-Ney Dental).....	59
(Figure 20): IPS Empress 1 ingots.....	59
(Figure 21): Placing the IPS Empress 1 Ingot in the investment ring.....	60
(Figure 22): Placing the AlOx plunger.....	60
(Figure 23): Ney Ceram Press Qex oven.....	61
(Figure 24): Placement of the investment ring with the ingot and the AlOx plunger at the center of the Ney Ceram Press Qex furnace.....	63
(Figure 25): Removal of the investment ring from the pressing furnace.....	63
(Figure 26): Place the investment ring on the cooling grid.....	64
(Figure 27): Mark the length of the AlOx plunger.....	64
(Figure 28): Separate the investment ring using a separating disk.....	65

(Figure 29): Break the investment ring at the predetermined breaking point using a plaster knife.....	65
(Figure 30): Rough divestment is carried out with glass polishing beads at 4 bar (60 psi) pressure.....	67
(Figure 31): Fine divestment is carried out with glass polishing beads at 2 bar (30 psi) pressure.....	67
(Figure 32): Using fine diamond disc to cut the sprue.....	68
(Figure 33): Checking of the coping on its corresponding metal die.....	68
(Figure 34): Non-anatomical wax pattern that was used in the correlation.....	70
(Figure 35): The start up menu of the program.....	70
(Figure 36): Select patient for new restoration.....	71
(Figure37): Entering the required data to create new patient....	71
(Figure 38): New restoration type selection.....	72
(Figure 39): Select material.....	72
(Figure 40): Impression screen.....	73
(Figure 41): Cerec propellant powder.....	73
(Figure 42): Die Sprayed with Cerec propellant powder.....	74
(Figure 43): inEos scanner.....	74
(Figure 44): Die secured on the specific tray of the inEos scanner using specific clay.....	75
(Figure 45): Digital impression of the die.....	75

(Figure 46): The wax pattern placed on the die.....	76
(Figure 47): Spraying of the wax pattern and the die with Cerec propellant powder.....	78
(Figure 48): Digital photo of the correlated occlusion.....	78
(Figure 49): Tracing of the preparation margins.....	79
(Figure 50): Adjustment of the insertion axis.....	79
(Figure 51): Adjustment of proximal contact line.....	80
(Figure 52): Adjustment of the coping line.....	80
(Figure 53 a): Buccal view of the crown coping.....	81
(Figure 53 b): Occlusal view of the crown coping.....	81
(Figure 53 c): Internal view of the crown coping.....	82
(Figure 54): Milling screen.....	82
(Figure 55): ProCAD blocks size I-14.....	83
(Figure 56): ProCAD block in its place in the milling machine...	83
(Figure 57): Closure of the milling machine door.....	84
(Figure 58): Scanning of block dimension.....	84
(Figure 59): ProCAD block milling.....	85
(Figure 60): Checking of the crown on its corresponding metal die.....	85
(Figure 61): The epoxy resin die.....	87
(Figure 62): Scanning Electron Microscope.....	87

(Figure 63): Specially designed holding device.....	88
(Figure 64): The coping on its corresponding die held by the holding device and placed inside the SEM.....	88
(Figure 65): Measuring of marginal adaptation.....	89
(Figure 66): Lloyd universal testing machine.....	91
(Figure 67): The epoxy dies were secured to the lower fixed compartment of the machine.....	91
(Figure 68): Fracture of the crown coping.....	92
(Figure 69): A bar chart for mean values of marginal gap of the crown copings fabricated with different finish lines and by different techniques.....	95
(Figure 70): A bar chart of marginal gap mean values for the crown copings fabricated by two different techniques with shoulder finish line.....	97
(Figure 71): A bar chart of marginal gap mean values for the crown copings fabricated by two different techniques with deep chamfer finish line.....	98
(Figure 72): A bar chart of marginal gap means values of the two different finish lines with Heat-pressed IPS Empress 1.....	100
(Figure 73): A bar chart of marginal gap mean values for the two different finish lines with CAD/CAM milled ProCAD.....	101

- (Figure 74):** A bar chart of marginal gap mean values for the crown copings fabricated by different techniques and with different finish lines.....103
- (Figure 75):** A bar chart of fracture resistance mean values for the crown copings fabricated with different finish lines and by different fabrication technique.....105
- (Figure 76):** A column chart of fracture resistance means values for the crown copings fabricated by different techniques with shoulder finish line.....107
- (Figure 77):** A bar chart of fracture resistance means values for the crown copings fabricated by different techniques with deep chamfer finish line.....108
- (Figure 78):** A bar chart of fracture resistance mean values for the two different finish lines with heat-pressed IPS Empress1.....110
- (Figure 79):** A bar chart of fracture resistance mean values for the two different finish lines with CAD/CAM milled Pro-CAD.....111
- (Figure 80):** A bar chart of fracture resistance mean values for the crown copings fabricated with different finish lines and by different fabrication technique.....113

List of Tables

	Page
(Table 1): Materials used in the present study.....	42
(Table 2): Sample grouping.....	44
(Table 3): Means and standard deviation (SD) of marginal gap values measured in μm for the crown copings fabricated with different finish lines by different techniques.....	95
(Table 4): Comparison of marginal gap values (Mean \pm SD) between the crown copings fabricated by two different techniques with shoulder finish line.....	96
(Table 5): Comparison of marginal gap values (Mean \pm SD) between the crown copings fabricated by two different techniques with deep chamfer finish line.....	98
(Table 6): Comparison of marginal gap values (Mean \pm SD) between the two different finish lines with heat-pressed IPS Empress1.....	99
(Table 7): Comparison of marginal gap values (Mean \pm SD) of the two different finish lines with CAD/CAM milled ProCAD.....	101
(Table 8): Two way analysis of variance ANOVA test comparing variables affecting marginal gap mean values.....	102

Table (9): Mean and standard deviation of fracture resistance values measured in Newton for the crown copings fabricated with different finish lines and by different fabrication techniques.....	105
Table (10): Comparison between the fracture resistance values (Mean \pm SD) of the crown copings fabricated by different techniques with shoulder finish line.....	106
Table (11): Comparison between the fracture resistance values (Mean \pm SD) of the crown copings fabricated by different techniques with deep chamfer finish line.....	108
Table (12): Comparison of fracture resistance values (Mean \pm SD) between the two different finish lines with heat-pressed IPS Empress1.....	109
Table (13): Comparison of fracture resistance values (Mean \pm SD) between the two different finish lines with CAD/CAM milled ProCAD.....	111
Table (14): Two way analysis of variance ANOVA test comparing variables affecting fracture resistance mean values.....	112