

Effect Of Water Storage Conditions On The Marginal Accuracy Of Different Provisional Prosthetic Materials

A Thesis Submitted to
The Faculty of Oral and Dental Medicine,
Cairo University

In Partial Fulfillment of the Requirements of
Master Degree in Fixed Prosthodontics

By

Abdulhameed Jarir Mohammad Alrayes

B.D.S. (2007)
Misr University for Sciences and Technology

Fixed Prosthodontics Department
Faculty of Oral and Dental Medicine
Cairo University

-2011-

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ قَالَ رَبِّ اجْعَلْ لِي صَدْرِي مُبَدَّرًا وَمِنْ بَيْنِ يَدَيْ وَيَسِّرْ لِي أَمْرِي ﴾

﴿ وَأَخْلُصْ عَقْدَةً مِنْ لِسَانِي يَفْقَهُوا قَوْلِي ﴾

صدق الله العظيم

(سورة طه - آية ٢٤-٢٨)

Supervisors

Dr. Eman Mohammad Anwar

Professor of Fixed Prosthodontics
Faculty of Oral and Dental Medicine
Cairo University

Dr. Sahar Gamal El-Din Zaki

Associate Professor of Fixed Prosthodontics
Faculty of Oral and Dental Medicine
Cairo University

Acknowledgment

First and Foremost, I fell indebted to ALLAH, the most kind and merciful who allowed me to accomplish this work,

I would like to express my deep appreciation and gratitude to my Supervisor Dr. Eman Mohamed Anwar, Professor of Fixed Prosthodontics, Faculty of Oral and Dental Medicine, Cairo University for her valuable guidance, effort, and for all the time she gave me to make the thesis possible.

I take opportunity to send my honest thankful to my Co-Supervisor Dr.Sahar Gamal El-Din Zaki, Associate Professor of Fixed Prosthodontics, Faculty of Oral and Dental Medicine, Cairo University for her kind suggestions, counseling, cooperation and scientific supervision during this study.

I am greatly thankful to Dr.Ihab Elsayed Mosleh, Professor and chairman of Fixed Prosthodontics department, Faculty of Oral and Dental Medicine, Cairo University for his encouragement and support during the work,

Finally I would like to thank all staff members of Fixed Prosthodontics department and my colleagues who participated in making this work possible.

Dedication :

To my supporting father and my loving mother for their continuous help, encouragement and prayer for me.

To my dear brothers (Faisal & Fadi) and sisters.

& To my friends (Gamal & Mashhour).

Contents

List of Figures	i
List of Tables	v
Introduction	1
Review of Literature	3
Aim of the Study	29
Materials and Methods	30
Results	57
Discussion	71
Summary & Conclusion	81
References	84
Arabic summary	

List of Figures

<i>Number of Figure</i>	<i>Title</i>	<i>Page Number</i>
1	Machinable acrylic blocks (VITA CAD-Temp).	31
2	Two pastes bis-acrylic composite system (Protemp 4).	32
3	Powder & liquid acrylic resin system (Acrostone).	32
4	Two pastes zinc oxide non-eugenol temporary cement (RelyX™ Temp NE).	33
5	Fifteen samples (A: Machined bridges, B: Two pastes system bridges, C: Powder/liquid system bridges).	35
6	Stainless steel die.	36
7	The working model.	36
8	Aluminum prop placed between the two dies.	37
9	Five working models.	37
10	Opaque powder spray (CEREC Optispray).	39
11	The dies and prop were sprayed with reflecting agent.	39
12	Optical inEos scanner.	40

<i>Number of Figure</i>	<i>Title</i>	<i>Page Number</i>
13	Multiple snapshots for each stainless steel die separately.	40
14	Designing (CAD) a fully anatomical long-term temporary bridge restoration using the inLab 3D software	41
15	Sirona CEREC inLab chairside system (CEREC MC XL).	43
16	Cylinder Pointed Bur 12 S and Step Bur 12 S	43
17	Milling with four burs.	44
18	Milled bridge attached with lug.	44
19	Machined bridge placed on the stainless steel dies	45
20	Five machined bridges.	45
21	Metal box.	48
22	Metal box held by holder for making the rubber key.	48
23	Machined bridge with sprue formers and split impression mold.	49
24	Split mold.	49

<i>Number of Figure</i>	<i>Title</i>	<i>Page Number</i>
25	Protemp4 injection.	50
26	Acrylic injection.	51
27	Five acrylic bridges placed on five working models.	52
28	The incubator.	53
29	Stereomicroscope.	55
30	Metal holder used to seat the bridge completely during measuring.	55
31	Photomicrograph showing measuring at nine selected points on the margins of the restoration with the die.	56
32	Columns chart showing the mean (mm) vertical gap distance in the three groups before cementation.	58
33	Columns chart showing mean (mm) vertical gap distance in the three groups after one day water storage after cementation.	60
34	Columns chart showing the mean (mm) vertical gap distance in the three tested groups after 2 weeks water storage after cementation.	61
35	Columns chart showing the mean (mm) vertical marginal gap distance of VITA CAD-Temp at different tested periods.	63
36	Columns chart showing the mean (mm) vertical marginal gap distance of Protemp4 at different tested periods.	64

<i>Number of Figure</i>	<i>Title</i>	<i>Page Number</i>
37	Columns chart showing the mean (mm) vertical marginal gap distance of Acrostone at different tested periods.	66
38	Columns chart showing the mean (mm) vertical gap distance of different variables interactions.	67
39	Photomicrograph showing marginal gap of VITA CAD-Temp before cementation.	68
40	Photomicrograph showing marginal gap of VITA CAD-Temp after one day water storage after cementation.	68
41	Photomicrograph showing marginal gap of VITA CAD-Temp after two weeks water storage after cementation.	68
42	Photomicrograph showing marginal gap of Protemp 4 before cementation.	69
43	Photomicrograph showing marginal gap of Protemp 4 after one day water storage after cementation.	69
44	Photomicrograph showing marginal gap of Protemp 4 after two weeks water storage after cementation	69
45	Photomicrograph showing marginal gap of Acrostone before cementation.	70
46	Photomicrograph showing marginal gap of Acrostone after one day water storage after cementation.	70
47	Photomicrograph showing marginal gap of Acrostone after two weeks water storage after cementation.	70

List of Tables

<i>Table number</i>	<i>Title</i>	<i>Page number</i>
1	Materials used in this study	31
2	Samples grouping	34
3	The mean (mm), standard deviation (SD) values and results of comparison between vertical gap distance in the three tested groups before cementation.	58
4	The mean (mm), standard deviation (SD) values and results of comparison between gap distance in the three tested groups after one day water storage after cementation.	59
5	The mean(mm), standard deviation (SD) values and results of comparison between vertical gap in the three groups after two weeks water storage after cementation	61
6	The mean (mm), standard deviation (SD) values and results of the change by water storage time in mean vertical gap distance of VITA CAD-Temp group.	62
7	The mean (mm), standard deviation (SD) values and results of the change by water storage time in mean vertical gap distance of Protemp4 group.	64
8	The mean (mm), standard deviation (SD) values and results of the change by water storage time in mean vertical gap distance of Acrostone group.	65
9	The mean (mm), standard deviation (SD) values and results of comparison between gap distance with different interactions.	67

Introduction

Fixed prosthodontic treatment, whether involving complete or partial coverage and natural tooth or dental implant abutments, commonly relies on indirect fabrication of definitive prostheses in the dental laboratory. Historically, the necessity for provisional treatment has been primarily derived from this methodologic process. The importance of interim treatment, however, is more far-reaching than is portrayed by this procedural necessity, and the requirements for satisfactory provisional restorations differ only slightly from the definitive treatment they precede. ⁽¹⁾

A provisional restoration is an important part of any successful treatment for fixed prostheses. ⁽²⁾ It is used to protect and sedate the pulp of prepared abutments, promote periodontal healing and health, evaluate parallelism of abutments, replace missing teeth, prevent migration of abutments and provide esthetics. Provisional restorations also assist in the development of occlusal schemes and evaluation of phonetics, occlusal vertical dimension and mastication. In addition, they protect abutments from microleakage and chemical injuries and stabilize compromised teeth. ⁽³⁾

Provisional crowns are seated on the prepared abutments at a critical phase of treatment, because soft tissues have been injured inadvertently during tooth preparation. Therefore, the most important morphologic and physiologic requirements for an interim crown is suitable marginal adaptation. ⁽³⁾

Shiny and smooth surfaces without porosities, strength, retention during function, cleansibility, esthetics, comfort, desirable contours and adequate embrasures, harmonious occlusion, and color stability are all factors that have contributed to a well-integrated provisional restoration.⁽³⁾

A hastily prepared, poorly adapted provisional restoration can result in plaque accumulation with subsequent periodontal problems that range from gingival inflammation with bleeding to gingival recession, especially when the margins of restorations are placed subgingivally.⁽³⁾

Provisional restorations are fabricated using resin based provisional restorative materials. Two major groups of materials, differing in their chemical nature, are currently available: methacrylate resins (liquid/powder, hand-mixed) and composite resin based materials (paste/paste, mainly auto-mixed)⁽⁴⁾.

In order to overcome the proportion and mixing errors of provisional restorations, a new provisional restorative material is recently introduced and supplied in form of machinable block for fabrication using CAD/CAM technology.

The present study intends to evaluate the recently introduced CAD/CAM provisional restorative material in comparison with two currently used resin based provisional restorative materials.