

The Effect of Two Different Bleaching Agents on the Micro-Hardness and Surface Roughness of two Resin Based Restoratives

Thesis

Submitted to the Faculty of Dentistry,

Ain Shams University

In Partial Fulfillment of the Requirements of the

Master Degree in Operative Dentistry

BY

Eman Nasser Ahmed Diab

B.D.S 2004, Faculty of Dentistry,

Ain Shams University.

2012

Supervisors

Dr. Hanan Abdel Aziz Niazi

Professor of operative dentistry,
Head of operative dentistry department,
Faculty of Dentistry, Ain Shams University

Dr. Omaila Hassan Ghallab

Lecturer of operative dentistry,
Faculty of Dentistry, Ain Shams University

تأثير استخدام نوعان مختلفان من المواد المبيضة للأسنان على صلابة وخشونة السطح لنوعين مختلفين من الحشوات الراتنجية

مشروع رسالة

مقدم لكلية طب الأسنان بجامعة عين شمس توطئة للحصول على درجة
الماجستير في العلاج التحفظي للأسنان

مقدمة من

الطبيبة/ إيمان ناصر أحمد دياب

بكالوريوس طب الأسنان – جامعة عين شمس ٢٠٠٤

This study was conducted to evaluate the effect of two different bleaching agents on the micro- hardness and surface roughness of two resin based restoratives (micro-hybrid composite resin and resin modified glass ionomer). A total of 120 specimens of the resin based restoratives were prepared in the form of cylindrical discs obtained with standard splitted mold 6 mm in diameter and 2 mm in depth. Sixty specimens of each resin based material were randomly divided into two major groups before bleaching into: a1- storage in distilled water in a glass container at 37⁰ C in an incubator for three months, a2- storage in distilled water in a glass container at 37⁰C in an incubator for one week. Samples in each major group were further sub grouped into b1- control samples, b2- samples bleached using (30 %carbamide peroxide agent once daily for thirty minutes for 3 days, b3- samples bleached using (6% carbamide peroxide once daily for twenty minutes for 14 days). The specimens then subjected to micro-hardness and surface roughness testing.

Results showed that the aging of samples for three months showed statistically significantly lower mean micro-hardness value and higher mean surface roughness value than one week. Bleaching with two different types of the bleaching agents significantly lowered the mean micro- hardness value



*First of all I thank **God** and express my gratitude for his guidance and support all over my path.*

*I would like to express my most sincere gratitude and grateful appreciation to **Dr. Hanan Abdel Aziz Niazi**, Professor of Operative Dentistry, Faculty of Dentistry, Ain Shams University for her kind guidance, sincerity, extraordinary supervision and unlimited support and help throughout my academic and clinical work.*

*I would like to thank **Dr. Oaima Hassan Ghallab** Lecturer of Operative Dentistry, Faculty of Dentistry, Ain Shams University for his excellent advice, valuable stimulating guidance and help during this study.*

*I would like to thank **all members of Operative Dentistry Department**, Faculty of Dentistry, Ain Shams University for their valuable help and cooperation.*



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة آية (٣٢)

Dedication

I wish to dedicate this work to

MY GREAT PARENTS,

MY LOVELY HUSBAND,

AND MY CUTE SON

List of Contents

<u>Title</u>	<u>Page</u>
List of Tables.....	ii
List of Figures	iii
Introduction	1
Review of literature.....	3
- Teeth Bleaching	3
- Direct esthetic Restorative Materials:.....	٥
- Resin composite.....	٦
- Glass ionomer cement.....	8
- Effect of bleaching on the surface micro-hardness of restorative materials.....	٩
- Effect of bleaching on the surface roughness of restorative materials.....	2٣
- Correlation between the surface roughness and micro-hardness following different bleaching procedures	٣٨
Aim of the study.....	٤٥
Materials and methods	٤٦
Results	٦١
Discussion	٨٢
Summary and conclusions	90
Recommendations	٩2
References	٩3
Arabic summary	--

List of Tables

Table	Title	Page
1	Restorative materials used.	46
2	Bleaching materials used.	47
3	Levels of the study.	49
4	Variables interaction s.	50
5	Bleaching procedures.	55
6	Results of the three -way ANOVA for the effect of material, bleaching, aging and their interactions on mean hardness.	61
7	The results of the micro-hardness comparison between the tested materials regardless of other variables.	62
8	The effect of aging periods on resin micro-hardness(Kgf/mm2) regardless of other variables.	63
9	The effect of aging periods of each restorative material regardless of bleaching material.	64
10	The effect of bleaching type on resin micro Hardness regardless of other variables.	66

List of Tables

Table	Title	Page
11	The mean, standard deviation (SD) of micro-Hardness values and results of comparison between the different interactions.	68
12	Percentage changes in micro- hardness compared to the control.	70
13	Results of three-way ANOVA for the effect of material, bleaching, aging and their interactions on mean surface roughness (Ra).	71
14	The results of comparison between materials Regardless of other variables.	72
15	The effect of aging periods on resin surface roughness regardless of other variables.	73
16	The effect of aging periods of each material regardless of bleaching material.	74
17	The effect of bleaching type on resin surface Roughness regardless of other variables.	76
18	The mean, standard deviation (SD) of surface roughness values and results of comparison between the different interactions.	78
19	Percentage changes in surface roughness (Ra)	80

List of Figures

Figure	Title	Page
1	Photograph showing microhybrid resin composite on the left and resin modified glass ionomer on the right.	48
2	Photograph showing the first bleaching agent bleaching agent (Vivastyle 30% carbamide peroxide) on the left and the second bleaching agent (Vivastyle paint on plus 6% carbamide peroxide) on the right.	48
3	Photograph showing copper splitted mould with internal four holes.	52
4	Photograph showing curing of resin composite samples through the glass slide and the polyester strips for 40 seconds on the left and the curing radiometer (Cure Rite,Efos Inc,Williamville,USA) on the right.	53
5	Photograph showing application of resin modified glass ionomer into the mold by the applicator on the left and curing of resin modified glass ionomer using the light curing unit through the glass slide and polyester strip for 40 seconds on the right.	54

List of Figures

Figure	Title	Page
6	Digital display Vickers micro-hardness tester (Model HVS-50, Laizhou Huayin Testing Instrument Co., Ltd. China).	58
7	Photograph showing surface roughness tester (TR 100 Roughness Tester, Time Group, Inc, USA).	59
8	Bar chart representing mean micro- hardness with the two materials.	62
9	Bar chart representing mean micro- hardness after 1 week and after 3 months.	63
10	Bar chart representing mean micro- hardness after week and after 3 months of each tested materials.	65
11	Bar chart representing mean micro- hardness treated with different bleaching types.	66
12	Bar chart representing mean micro- hardness of Different interactions.	69

13	Bar chart representing mean micro- hardness Different interactions.	69
14	Bar chart representing mean surface roughness with the two materials.	72
15	Bar chart representing mean surface roughness Ra after 1 week and after 3 months.	73
16	Bar chart representing mean surface roughness Ra after 1 week and after 3 months of each restorative material.	75
17	Bar chart representing mean Ra with different bleaching types.	76
18	Bar chart representing mean Ra of different interactions.	79
19	Bar chart representing mean Ra of different interactions.	79

The use of bleaching techniques for improving of esthetics of natural dentition has become increasingly popular since 1989⁽³⁷⁾. It is considered an economical and efficient method that preserves tooth structure ⁽³⁹⁾. The technique may be offered in the dental office or at home.

With the home bleaching technique, the patients apply bleaching solutions, most of which contain 10-15% carbamide peroxide. Over the past few years, in-office tooth bleaching systems employing the use of strong oxidizing agents have been re-introduced. The advantages are that treatment is totally under the dentist's control, the soft tissues are generally protected from the process and it has the potential for quick bleaching in situations in which it is effective ^(9,10).

Dental practitioners are seeking a single restorative material that can accommodate a wide range of applications for both anterior and posterior restorations. Composite resin materials demonstrate continual improvement in strength, wear resistance, handling, and esthetics. ⁽¹⁹⁾

Resin-modified glass ionomers have the advantage of added toughness and flexibility to the relatively brittle

conventional glass ionomer. The modified cements claim to have improved esthetics and mechanical properties while maintaining the benefits of conventional products, such as localized fluoride release and adhesion to the tooth.⁽⁷⁰⁾

Restorative filling materials used in dentistry require long-term durability in the oral cavity. One of the most important physical properties of restorative filling material is surface hardness. The hardness of a material is a relative measure of its resistance to indentation when a specific load is applied. It was reported micro hardness has been shown to be an adequate indicator of the degree of conversion or polymerization of composite resin. The degree of polymerization may be related to the clinical performance of resin restorative materials.⁽⁹⁴⁾

Surface roughness of restorations is one of clinically important physical property that warrants investigation. The surface finish of restorations influences appearance, plaque retention, surface discoloration and gingival irritation.⁽⁹⁸⁾

Although bleaching is safe from a procedure stand point, it may not be safe for dental materials that have high degradation characteristics. Peroxide-based agents provide