Sealability and Pulpal Response to Bonded Resin Composite and Glass Ionomer Cement Restorations following the use of two Remineralizing Solutions : In-vivo Study

Thesis
Submitted to the Faculty of Oral and
Dental Medicine Cairo University
In Partial Fulfillment of the Requirements
for the Doctor's Degree in Operative Dentistry

By
Sahar Ahmed Mohamed Abd El Halim
B.D.S.; M.D.Sc.
Cairo University

2006

Supervisors

Prof. Dr. Mona Ismail Riad
Professor of Operative Dentistry Department
Faculty of Oral and Dental Medicine
Cairo University

Prof. Dr. Mohamed Riad Farid
Professor of Operative Dentistry Department
Faculty of Oral and Dental Medicine
Cairo University

Prof. Dr. Mohsen Hussein Abi Elhassan
Professor of Operative Dentistry Department
Faculty of Oral and Dental Medicine
Cairo University

Dr. Mohamed Karam El Said El Said Zabady
Associate Professor of Surgery, Aneshetization and Radiology
Faculty of Veterinary Medicine
Cairo University

I would like to express my endless gratefulness to ***Gracious God*** *for helping me to achieve this work.*

I would like to acknowledge ***Prof. Dr. Mona Ismail Riad*** *Professor of Operative Dentistry Department, Faculty of Oral and Dental Medicine, Cairo University for her support, continuous guidance and her encouragement throughout the entire period of the study.*

I would like to express grateful thanks and gratitude to ***Prof. Dr. Mohamed Riad Farid*** *Professor of Operative Dentistry Department, Faculty of Oral and Dental Medicine, Cairo University for his kind supervision, valuable guidance and fruitful criticism.*

It is my pleasure to express my unlimited appreciation and deepest thanks to ***Prof. Dr. Mohsen Hussein Abi El Hassan*** *Professor of Operative Dentistry Department, Faculty of Oral and Dental Medicine, Cairo University for his continuous supervision, great help, guidance and encouragement during the whole part of the study.*

I would like to thank ***Dr. Mohamed Karm El Said Zabady*** *Associate professor of Surgery, Aneshetization and Radiology, Faculty of Veterinary Medicine, Cairo University for his cooperation and generous help during research work.*

My deep gratitude is also to ***Dr. Louloua Mohamed Fathy*** *professor of Oral pathology,* ***Dr. Amal Hasan and Dr. Dalia El Rouby*** *Associate professor of Oral pathology, Faculty of Oral and Dental Medicine, Cairo University for their generous help in the histopathological study. Without their efforts this work could not come into existence.*

I would like also to acknowledge ***all the staff members*** *of the operative Dentistry Department, in both Faculty of Oral and Dental Medicine, Cairo University and Faculty of Dentistry Misr University for science and technology for helping and encouragement me to carry this work.*

:
.

:
::.

:

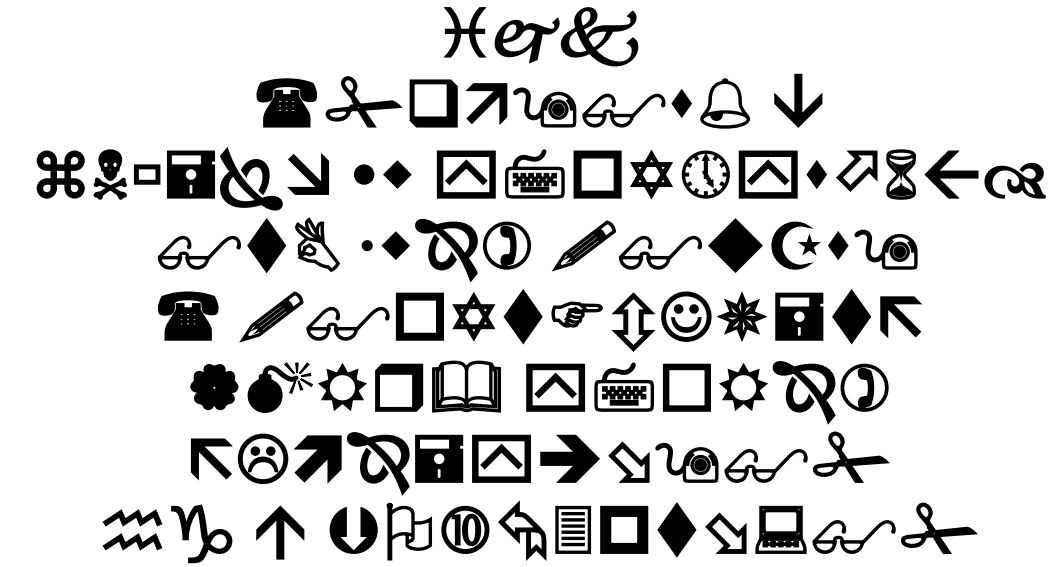
:

:

::
:
:

:):
::

:



[سورة البقرة: الآية ٣٢]

Acknowledgment

The aim of the present investigation was divided into two folds: First, was to evaluate the in vivo marginal sealing across the restorations/tooth bond interface in dogs teeth using two different remineralizing solutions.

Second, was to evaluate the pulpal response to such materials and procedures at different cavity depths.

The objectives were :

1- To study the effect of different remineralizing solution on the quality of in-vivo interfacial gap of two esthetic restorations.

2- To evaluate the effect of the tested restorative materials on the in vivo sealability of class V restorations.

3- To assess the pulp response to such materials and procedures at different cavity depths.

I- Materials:

1- Adhesive resin system.

One self etching adhesive system.* (3M ESPE Adper prompt™ L- Pop) was used in this study.

It offers easier activation for a more consistent, reliable mix and improved chemistry for better dentin bond strength.

Components consist of:

- Liquid 1 (red blister): Methacrylated phosphoric esters, Bis-GMA
- Initiators based on camphorquinone and Stabilizers.
- Liquid 2 (yellow blister): Water, Hydroxyethyl methacrylate (HEMA).
- Polyalkenoic acid and Stabilizers fig.(1a).

2- Restorative materials:

-Two tooth colored restorative materiales were used.

*a- Resin composite** (3M Filtek™ Z 250).*

It is a visible-light activated radiopaque restorative packable resin composite. The filler in is zirconia/silica. The inorganic filler loading is 60% by volume with a particle size range of 0.01 to 3.5 microns. Filtek Z 250 restorative contains BIS-GMA, UDMA and BIS-EMA resins fig. (1b).

---

* Adper prompt™ L-Pop,3M,159865,USA.

** Filtek™ Z 250,3M,1370A3, USA.

b- Glass ionomer cement[*] (3M ESPE Vitremer™).

It is comprised of powder/ liquid system of conventional glass ionomer plus the vitremer visible light cure cavity primer which wet the bonding surfaces to facilitate adhesion. The powder is radiopaque, fluoroaluminosilicate glass. The liquid is a light sensitive, aqueous solution of a modified polyalkenoic acid fig. (2).

3- Testing agents.

Two testing agents will be examined as remineralizing agents.

a- C5[**] (phosphoprotein – calcium phosphate complex) .

It is a group of Casein phosphopeptides derived from bovine milk, which can be used to augment the action of the phosphopeptides present normally in saliva fig.(3).

b- Zadsilla[***] mouth wash (Aluminium chloride 153 gm/1 , Calcium hydroxide 12.5 gm/1, Menthol 0.12%), usually used for treatment of gingivitis and arrestment of decay fig.(4).

---

* Vitremer™, 3M, 0123A3,USA.

**Topacal C5, NSI Dental Pty Ltd, Australia.

*** Zadsilla, Arab Co. for Pharm.& Medicinal plants. No. 21636/2002

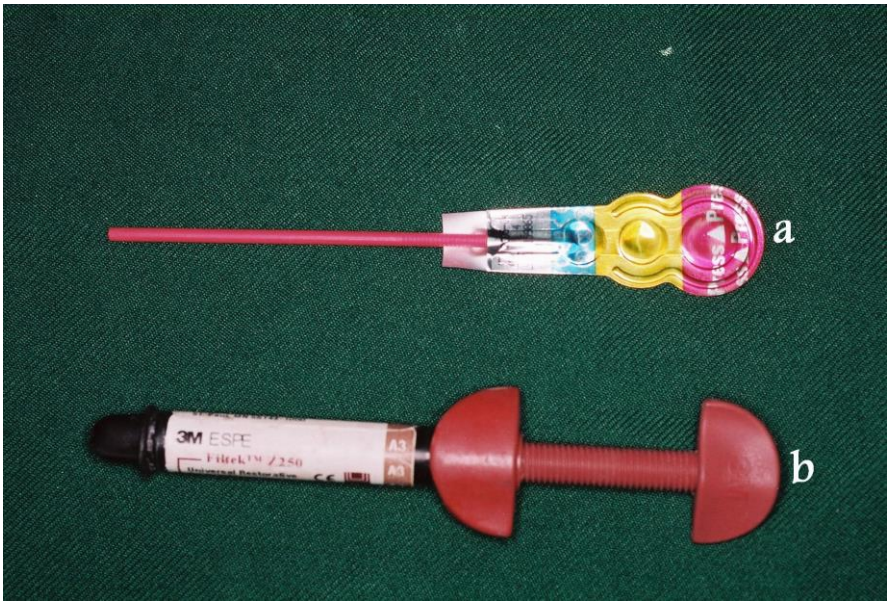


Fig. (1): *a- Self etching adhesive system. (3M ESPE Adper prompt™ L- Pop).*

b- Resin composite (3M Filtek™ Z 250).

Fig. (2): *Glass ionomer cement (3M ESPE Vitremer™).*

Fig. (3): *Remineralizing agent C5.*

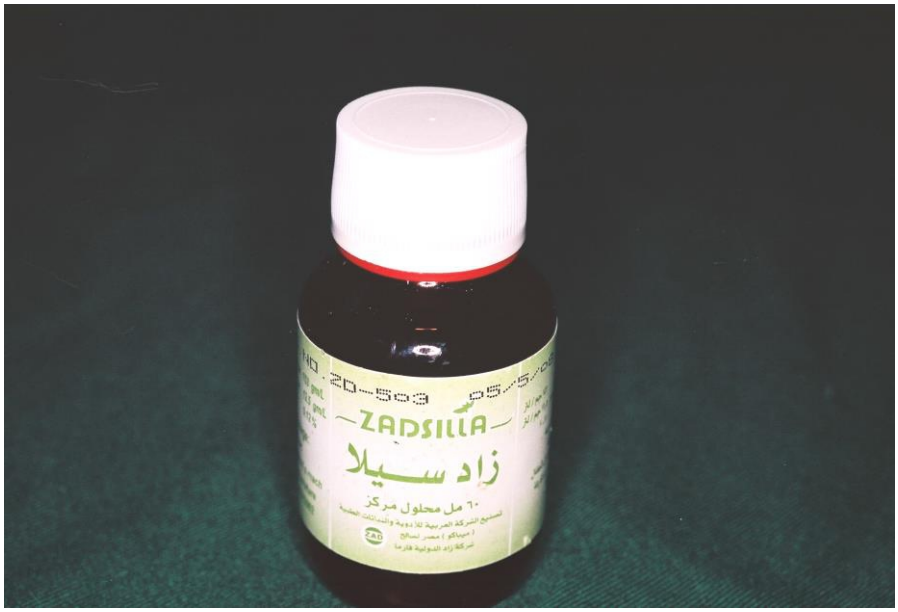


Fig.(4): *Remineralizing agent Zadsilla.*

Table (1): Level of the study for sealability.

Variables	Symbol	Refered to
Test materials	G_1	Resin composite with all in one bonding system
	G_2	Glass ionomer with its conditioner
Testing agents	M_1	C5 (phosphoprotein-calcium phosphate complex)
	M_2	Zadsilla

Testing periods	T_1	7 days
	T_2	30 days
	T_3	90 days

Table (2): Interaction of various levels of the study.

Materials / **Mineralizing Solution**	**G_1**		**G_2**	
	M_1	**M_2**	**M_1**	**M_2**
Testing period				
T_1	$G_IM_IT_1$	$G_IM_2T_1$	$G_2M_IT_1$	$G_2M_2T_1$
T_2	$G_IM_IT_2$	$G_IM_2T_2$	$G_2M_IT_2$	$G_2M_2T_2$
T_3	$G_IM_IT_3$	$G_IM_2T_3$	$G_2M_IT_3$	$G_2M_2T_3$

N=10

Table (3): Variable of the study for pulp response:

Variables	**Design**	**Refered to**
Test materials	G_1	Resin composite with all in one bonding system
	G_2	Glass ionomer with its conditioner
Testing agents	M_1	C5