

SEM study on ceramic ormocer effected by dietary stimulating solvents

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Abstract:

Ormocer the newly developed organically modified ceramic are interesting and promising materials, and may become an interesting filling material for stress bearing class II restorations.

Intra oral conditions can be expected to be more complex than those achieved in employing 37°C distilled water (D.W.) in laboratory. Thirty specimens prepared and stored for 14 days in d.w., corn oil, 50% ethanol and divided to two groups, polished.

A study done to investigate microstructural examination of the actual specimens in the SEM revealed equalization differences in the surface texture between polished and non polished Ormocers in the different storage media with no cracks formation.

Key words:

Ceramic ormocer, SEM, surface roughness, color stability.

Introduction:

More patients today are well informed about dental care and are seeking tooth - colored restorative alternatives^(1,2,3). As the wide spread use of amalgam and its well-known benefits, so it will not be an easy task to find or synthesis a material that will act as a complete replacement of amalgam⁽⁴⁾. Now direct restorative materials are good with respect to esthetics, but all material

characteristics must be considered, such as mechanical properties, biological effects, and long term clinical behavior⁽⁵⁾. The development of a wear-resistance composite resin for use in posterior teeth has been an elusive goal for the dental profession⁽⁶⁾. Recent advances in resin - based composite systems have led to expect a high degree of success when restoring posterior teeth⁽⁷⁾. With packable composite, which have been introduced as an amalgam alternative,

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the time that posterior composite is a total replacement for amalgam is quickly coming^(8,9). Ormocers, the newly developed packable organically modified ceramics are interesting and promising materials⁽¹⁰⁾. And may become an interesting filling material for stress bearing class II restorations⁽¹¹⁾. Composite restorations are not stable after polymerization and constantly interact with their environment⁽¹²⁾. So the role of dietary factors as etiological agents have been investigated in this research according to the FDA latest version of Guidance for chemistry recommendations⁽¹³⁾. The aesthetics and longevity of tooth colored restoratives are highly dependent on their surface characteristics. Ideal surface could not be produced against a matrix strip & some finishing procedures against a matrix strip & some finishing procedures were necessary^(14, 15). Studies investigating the effects of different polishing methods on newer packable composite restorative materials is limited⁽¹⁶⁾.

And the effect of food - simulating liquids dental composite properties were largely varied with different results that may be due to the type of material or testing procedure⁽¹⁷⁾. Ormocer has a poorly understood complex composition, still contains barium glass & silica as an inorganic fillers^(18,19). Mechanical properties & wear behavior are highly influenced

by the filler system⁽²⁰⁾. The high wear resistance of the ormocers supports their possible use as filling materials in stress - bearing situations⁽²¹⁾. Packable resins, e.g ormocer are less capable or reducing the contraction stress during the early setting stage, thus not superior in maintaining the bond with cavity walls than conventional hybrid composite teric ceram⁽²²⁾. Ormocer - definite were less cytotoxic after 8 weeks of aging than they were in weeks of aging than they were in early intervals and post - curing was not generally useful in reducing cytotoxicity⁽²³⁾. The aim of this study is to evaluate the timing effects of food simulating solvents on the surface of organically modified cermics ormocers on polished & non polished surfaces by using scanning electron Microscope.

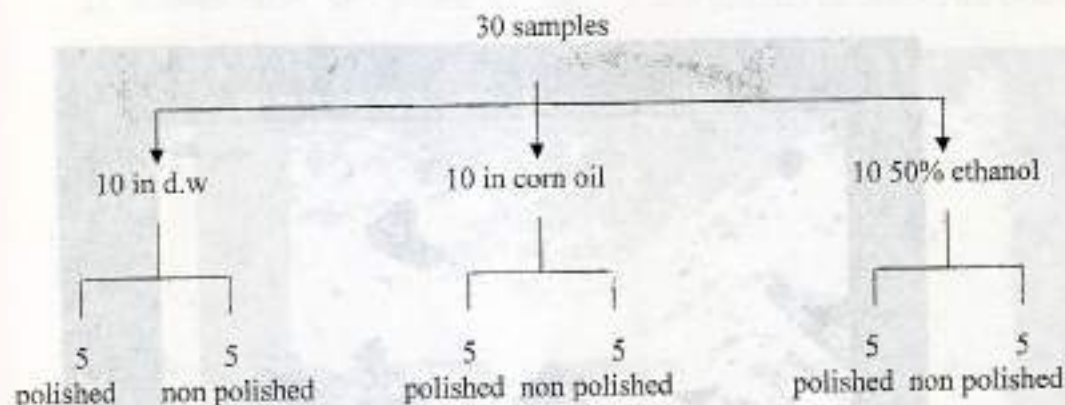
Materials and Methods:

We filled a teflon mold which has 4.5 mm diameter and 2 mm high with ormocer by dental gun and covered it with dental strip and cover microslide was put on to the mold with 2x 50 gm weight on each side of the slide to provide a standardized pressure.

Curing time was 40 seconds as recommended by manufacturers. Each mold used for construction of 5 disks of ormocers. Any disk having an air bubble or pitted surface were discarded and changed by another one.

Thirty samples prepared and stored for 14 days in distilled water (d.

w), corn oil, 50% Ethanol (10 for each group) as shown below:



Half of the disks prepared by this way were polished immediately after light polymerization and to simulate clinical situation with gray politip - finisher silicon rubber and green politip - polisher silicon rubber sequentially in a low - speed hand piece mounted on dental surveyor with water coolant rotary instrumentation was done for 30 seconds per specimen⁽²⁴⁾.

The other half of samples were remain as - set surface and both strips were discarded after each use.

After 14 days of aging several pictures were taken to see the surface of polished & non polished Oromocer's conditioned with different food stimulating liquids.

Results:

The surface roughness the Vickers microhardness and the color

stability for all conditioned groups with different time intervals studied in previous research⁽²²⁾, as a result from that study it was clear that polishing of the composite will increase the surface hardness & roughness in comparison to the non-polished surface.

Also aging time will increase the hardness of polished surface, while decrease the roughness of only non-polished surface, especially in d.w group. Conditioning with various F52, not effect surface roughness of Ornocers while just long time storage (14) days will decrease the surface hardness in comparison to the control group. So we find it is useful to investigate that results and see it under. SEM & compare between the polished & non polished surfaces of the Ornocers using the S.E.M (stereo scan 240, cambridge instrument) microstructural examination of the actual specimens in the SEM of

d.w a specimens revealed equalization differences in surface texture between

polished & non polished Ormocers (fig 1).



(a) Non-polished Ormocers aged in D.W. for 14 days



(b) Polished Ormocers aged in D.W. for 14 days

Fig 1, (a&b)

SEM for polished & non polished ormocer's aged 14 days in D.W.

The SEM Microstructural examination of the specimens of 50%

ethanol revealed no different storage media with no cracks formation (fig3).



(a) Non-polished Ormocers aged in ethanol 50%.



(b) Polished Ormocers aged in ethanol 50%.

Fig 3 (a&b)

SEM for polished & non polished Ormocers aged 14 day in Ethanol 50%.

Discussion:

The aesthetic and longevity of tooth - colored restorations are highly dependent on their surface characteristics.

A well - contoured & polished restoration promotes oral health by resisting the accumulating of food, debris & pathogenic bacteria & enhance oral function & esthetic ⁽²⁴⁾. Surface degradation by chemical and / or enzymatic attack is of considerable interest for composite systems under stress. Surface hardness and roughness were used to detect wear or degradation (surface loses) ^(23, 26, 27). It is impossible for a dentist to place restoration without creating excess, so finishing and polishing are necessary. The test utilized in this study are at best approximation of the forces and conditions which operate in oral environment. Predicting the in vivo durability and esthetic quality of composites for long time duration. But it may exaggerate the softening effect on the chemical resistance of the dental composite tested.

So as a result Ormocers had a stable chemical composition and a very good polished surface with politip F & P that made no difference in color change between polished & non polished surface.

Results from the visual comparison of SEM revealed that there were qualitative difference between

resin - rich surface formed by matrix strip and the polished surface. This finding is in agreement with the result obtained from profilometer for all conditioning liquids ⁽²⁶⁾.

Macroscopic cracks & extensive microcracks were not observed in ormocer's aged in food stimulating liquids (FSL) which had been reported elsewhere by ethanol conditioning ⁽²⁸⁾ this finding is in agreement with the over all hard surface measured with micro hardness tester ⁽⁹⁾. SEM revealed no change between specimens aged in FSL and in control (d.w.).

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