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Review Article

EVALUATION OF THE EFFECT OF 15% CARBAMIDEPROXIDE ON THE COLOR OF NANOHYBRIDE RESIN COMPOSITE FILTEK Z-350XT AND STAINING SUSCEPTIBILITY OF THIS COMPOSITE AFTER BLEACHING INVITRO

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ABSTRACT
Aim: The present research aims to examine effect of bleaching with 15% Carbamide Peroxide and rate of nanohybrid composite Filtek Z-350 XT (3m-ESPE, StPaul, MN, USA) and Color Stability of this composite in color solutions. ***Method:*** 42 composite discs by 10 mm diameter and 1 mm thickness were prepared. 21 discswere subjected to bleaching via 15% Carbamide Peroxide and 21 discs were kept in distilled water at room temperature. Colorimetric was fulfilled before and after this stage via spectrophotometer under three components of ΔL, Δa and Δb for each sample. Then, the samples were set incolor solutions including coffee, cola and grape juice for two weeks and then colorimetric was applied. ***Analysis:*** Mannwhithney-test, one-way ANOVA and Tukey HSD were considered to observe effect of bleaching on color of composites, difference between bleached and non-bleached composite in color stability, and extent of effect of these three solutions on color of composites at $P_{value} \leq 0.05$. ***Results:*** Bleaching has not had a significant effect on nanohybrid composite Filtek Z-350XT (3m-ESPE,St Paul, MN, USA) color. Color stability of composite was not increased after bleaching. Coffee has had the highest effect on changing color of composites. ***Significance:*** Nanohybrid compositeFiltek Z-350XT (3m-ESPE, St Paul, MN, USA) after bleaching is not subjected to color stability.

Keyword*: Bleaching, Compositeresin, Stain susceptiblity, Carbamide Peroxide15%*

INTRODUCTION
With regard to increasing need of patients to beauty treatments, tooth-colored restorative materials are demanded by patients. Despite improvement in quality of these materials in recent years, huge attempts have been made to provide the materials that have the highest durability and beauty and the lowest need to replacement (Kroeze *et al.,* 1990). One of the reasons for replacement of tooth-colored restorations lays ondiscoloration of these restorations after working for a certain period in the mouth (Wilson *et al.,* 1997). Intrinsic and extrinsic factors contribute in discoloration of resin restorations (Um and Ruyter, 1991). Intrinsic reasons for discoloration of resin restorations include resin or filler structure and their incomplete polymerization (Um and Ruyter, 1991). The extrinsic factors for discoloration of resin restorations include absorption of pigments in the materials such as Tea, coffee, nicotine (Um and Ruyter, 1991). Surface characteristics such as levels of coarseness can affect color stability of restorations (Asmussen and Hansen, 1986; Dietschi *et al.,* 1994). Effective factors in surface coarseness of resin restorations include size and type of their filler, composition of resin matrix, finishing and polishing method and bleaching (Jefferies, 1998; Reis *et al.,* 2003; Reis, 1994; Turker and Biskin, 2003; Cehreli *et al.,* 2003; Canay and Cehreli, 2003).Bleaching by dentist is one of the safe beauty treatments in clinic at higher Hydrogen peroxide concentrations (Haywood, 1992; Haywood, 1994). During bleaching, bleaching materials in addition to teeth will be in contact with the restorations existing in mouth. Burgers and cooley stated that surface roughness, hardness, and morphology of resin-based composites increase after bleaching (Cooley and Burger, 1991). In another study on Surface roughness of nonoil and monohybrid composite resin and ormocer-based tooth-colored restorative materials, the surface roughness has increased (Gurgan and Yalcin, 2007). Turker and Biskin (2003) stated that increasing surface roughness of composite resins can increase their color stability. The present research seeks to examine coffee, red

wine and cola on Microhybrid Composite Filtek Z-250 (3m-ESPE, StPaul, MN, USA) with or without contact with 15% carbamide peroxide bleaching. Presumption of this study lies on this fact that coloring materials have the same effect on composite and bleaching or non-bleaching composite has not any effect on color stability of composite.

MATERIALS AND METHODS

Filtek Z-350XT (3M-ESPE, ST Paul, MN, USA) is the resin composite used in this study, which is a nanohybrid composite resin. Opalescence 15% CP (Ultradent, St Jordan, UT, USA) has been the bleaching material used in this study, that the chemical compositions for these materials have been represented in table 1.

Table 1: Composition of main materials that been used

Material	Manufacturing factory	Composition
Z350XT composite	3M-ESPE ST Paul , MN , USA Shad A2	Filler : 20-50 nm 78.5 % wt Matrix : Bis GMA UDMA TEGDMA Bis-EMA
Opalesscence PF15%	Ultaradent (South Gordan,UT,USA)	15% CP 3% Potassium Nitraate C 2% Flouraidecarbopol Golucerin Flauring agents

Preparation of Samples

42 composite discs to the dimension of 10 mm and thickness of 1 mm in a PTFE (Polytetrafluoroethylene) sheet covered with polyester tape (Mylar, Henry Schein, Melville, NY, USA) were made. Then, resin composites were polymerized via dental light cure Valo (Ultradent product south Jordan, UT, USA) under standard state for 20s with light intensity of 1000 MW/CM^2 from upward. The light coming from dental light cure was controlled via radiometer (Kerr, Demetron, and Orange, CA, USA) after lighting. To achieve a flat and standard surface, a high level of samples on Silicon Carbide Powder 1200 grit was sprayed with water. Then, the samples were kept at room temperature for two weeks. At this stage, color variables of each sample (L^*, a^*, b^*) were measured via Spectrophotometer (Dr.langmicrocolor, brave instrument Belgium) and mean was reported in form of raw data.

Bleaching Regime

Samples were divided into two groups. One group named non-bleaching group was kept in distilled water at room temperature for two weeks and another group name bleaching group was undergone bleaching regime. Surface of the samples in the second group was subjected to bleaching material (Opalescence PF15%) during 14 days for 7 hours in a day and then the samples were washed with water after being subjected to bleaching material after ending 7 hours and the samples were kept in distilled water at room temperature at the rest of hours in a day and color of the samples in both groups was measured at the end of two weeks.

Staining Procedure

Each group was divided into three sub-groups in random and each sub-group was subjected to a coloring material for two weeks. The used coloring materials include:

1-coffee: 5 gram5 equivalent to approximately one teaspoon of espresso (Nescafe Classic, Nestle, Istanbul,Turkey) at 200cc boiled water

2-cola

3-red wine (San Ich, Tehran, Iran)

Color Measurement Method

The color variables (L^*,a^*,b^*) were measured via spectrophotometer (Dr.langmicrocolor, brave instrument Belgium) at each sample. Quality of color was elaborated via international system (Commission de l'Eclairage) and three agents (LΔa, Δb, ΔL) compared to standard conditions, spectrophotometer was calibrated via standard white card before measurement and measurement was repeated for three times for each sample.

Results

Mann whither-test indicated that bleaching has not effect on color of composite (p-value=0.683). Further, Mann Whitney indicated that there is no difference on color stability in bleaching and non-bleaching composite (p-value=0.146).

Table 2: Mean of color change in bleaching and non-bleaching composite groups

Group		ΔE	SD
Composite after bleaching	1.56	1.3	
Composite in water	1.81	1.8	
bleaching composite	6.59	4.7	
non-bleaching composite	8.92	4.39	

Yet, one-way ANOVA and Tukey HSD indicated a significant difference on influence of coloring solution on composite, such that coffee has had the highest effect on bleaching and non-bleaching composite rather than cola and red wine.

Table 3: Comparison of effect of coloring solutions on non-bleached composite

Group	EΔ	SD	MAX	MIN
cola	5.4972	3.72170	11.76	2.34
red wine	9.5080	4.93907	15.85	5.40
coffee	11.7741	2.02176	14.86	9.50

Table 4: Comparison of effect of coloring solutions on bleached composite

Group	EΔ	SD	MAX	MIN
cola	2.2772	1.16644	3.43	.84
red wine	5.7092	3.80361	11.27	2.66
coffee	11.5424	2.31829	14.60	8.79

Values of ΔE_{ab} greater than 3 were used as positive clinical criteria for color detection in this study; this value equaled to 11.62, 3.88 and 7.6 for coffee, cola and red wine, respectively.

Discussion

Bleaching has appeared as one of the common treatments in dentistry clinics. Since avoidance from contact of bleaching material in different bleaching methods is not possible via Restorative Dental Materials, in the present research an attempt was made to examine effect of bleaching on nano-hybrid composite as well as amount of color stability of this composite after bleaching in three coloring solutions including cola, red wine and coffee. Yu *et al.,* (2009) stated that composite after bleaching than non-bleaching can be more likely influenced of color. They announce this influence due to surface changes in composite in contact with bleaching material (Yu *et al.,* 2009). Studies indicate that effect of bleaching materials on composite restorations surface depends on bleaching material and contact time (Polydorou *et al.,* 2006; Polydorou *et al.,* 2007). According to SEM and profilometry studies, it has been displayed that 10% and 16% carbamide peroxide tooth-whitening gels can increase porosity of hybrid and microfilmed composite (Tu¨Rker and Biskin, 2002; Tu¨Rker and Biskin, 2003). Anyhow, in a study on effect of 6% of hydrogen peroxide on hybrid composite with periods kept in saliva, it has been displayed that saliva can reduce effectiveness of hydrogen peroxide on surface characteristics of

restoration materials through development of a protective layer (Schemehorn *et al.,* 2004). According to the study by baily & swift, 10 % carbamide peroxide after a four-week regime therapy in addition to increase of surface roughness of restoration materials on microfilmed samples has raised crack (Bailey and Swift, 1992). Wang *et al.,* (2011) stated that effect of bleaching material on surface of restorative materials regarding time and type of material can be different, such that effect of bleaching materials on each of composites has been different in their study. Implant material which was used in this study has PH equal to 6.7, that such PH cannot have acidic features and cannot cause rise of surface roughness at the surface of composite. Further, time of utilization can be another reason for lack of influence of these materials on restoration surface. In the studies with huge influence of carbamide peroxide as bleaching material, longer contact time has been reported (Schemehorn *et al.,* 2004; Bailey and Swift, 1992). In the present research, 15% carbamide peroxide has not had any effect on color of composite. Canay and Cehreli (2003) indicated that use of 15% carbamide peroxide or 30% hydrogen peroxide can change color of composites at the range of EΔ between 2 to 11(Campos *et al.,* 2003). Li *et al.,* (2009) mentioned significant changes in color of nano-hybrid composite after contact with 15% carbamide peroxide. In another study, it has been declared that highHydrogen peroxide concentrations in contact with the materials containing high resin matrix can raise color change (Hubbezoglu *et al.,* 2008). In general, color change in restorative materials has been found due to Surface oxidation of the pigment and amine content, and this can raise color change in composites over the time. Degree of conversion has been mentioned as another effective factor in durability of color of composites in contact with bleaching materials, under which more color change will occur in self-cured adhesive composite resins than light-cured adhesive composite resins (Rosentritt *et al.,* 2005). This study indicated that composite Filtek Z-350XT (3m- ESPE, StPaul, MN, USA) at different coloring solutions indicates different color stability. In this study, coffee has had the highest effect than other coloring materials. In the study by Bagheri and Burrow (2005), coffee has had the highest effect on color stability. Some studies have known effectiveness of coffee and tea the same (Yazici *et al.,* 2007). Further, in a study by Bullem *et al.,* (2009), effect of tea has been mentioned higher than effect of coffee (Cigdem *et al.,* 2009). In the present research, coffee, red wine and cola have had the highest effect, respectively.

Conclusion

Despite this fact that bleaching materials can affect surface features of composites and increase surface roughness, this effect is not in a way to have a significant effect on color stability of nano-hybrid composite.

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