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Original Research Article

Color Stability of Various Types of Dental Composites Following Exposure to Home Bleaching System; An *in vitro* Study

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Introduction: There are evidences that relate to the change in color of composite when exposed to colored solutions or bleaching agents. The extent of color change depends on several factors, which include the duration of exposure and concentration of bleaching agent. Materials and methods: This is an experimental study, which utilized three types of composite materials on the basis of filler content and resin composition including Ormocer, Nanohybrid, and Fine particle hybrid. Results: When measured the values immediately at the beginning of the experiment, Ormocer showed a mean value of 0.61, Nanohybrid showed a mean value of 0.83 and Fine particle hybrid mean value was 0.90. Conclusion: It can be concluded that Orcomer composite material showed a significant change in color as compared to nanohybrid and fine particle hybrid materials.

Keywords: Color stability, Dental composite, Home bleaching, Nanohybrid, Fine particle hybrid.

INTRODUCTION

Composite materials come in a variety of types and compositions, which are widely used by dental practitioners. These materials are different from each other on the basis of particles size and filler contents. Several types of composited include the hybrid resins, flowable, condensable etc. It is important to mention that each of these materials has different properties, characteristics, and nature. Therefore, they react differently to foreign materials that tend to change their surface texture or color (Garcia et al, 2006).

There are evidences that relate to the change in color of composite when exposed to colored solutions or bleaching agents. The extent of color change depends on several factors, which include the duration of exposure and concentration of bleaching agent (Villalta et al, 2005). Speaking of materials having a variety of types and compositions, bleaching agents are either composed of carbamide peroxide or hydrogen peroxide. These components are available in 10%, 15%, 22% etc, which have varying effect on the color of composite materials. Carbamide peroxide has exhibited more color change in resins as compared to hydrogen peroxide (Canay & Cehreli, 2003).

Furthermore, composite materials such as Admira, Durafill VS and Gradia Direct have been tested under different types of bleaching agents. The results concluded that each bleaching material had a different change in color of individual composite material. Thus, proving that composition and concentration has an important role to play in causing color change (Hubbezoglu et al, 2008). Another investigation was conducted to assess the color change of nano-composite when exposed to 4 different types of bleaching agents. It was revealed that there was no significant change in color in the nano-composite materials (Costa et al, 2009).

AIMS OF THE STUDY

- To determine the change in color among different types of composite materials when exposed to 22% carbamide peroxide.
- To compare the different composite materials on the basis of the extent of color change.

MATERIALS AND METHODS

This is an experimental study, which utilized three types of composite materials on the basis of filler content and resin composition including Ormocer, Nanohybrid, and Fine particle hybrid. These composites were prepared in disc shape (1mm thickness, 8mm length) and exposed to 20% carbamide peroxide bleaching agent, which is used as anin-home remedy for teeth discoloration. Shade A-2 was used for all three types of composites in order to standardize and convenience of color change measurement.

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4 discs for each composite type were exposed to the bleaching agent for 2 months. Bleaching agent was changed every 2 weeks and shade was recorded using a colorimeter in 2 stages (First, Immediately at the start of the experiment, second after 2 months).

RESULTS

When measured the values immediately at the beginning of the experiment, Ormocer showed a mean value of 0.61, Nanohybrid showed a mean value of 0.83 and Fine particle hybrid mean value was 0.90. Their median values were 0.56, 0.88 and 0.93 respectively. On the other hand, when measured the values after 2 months of experiment, Orcomer revealed a mean score of 0.84, Nanohybrid mean score of 1.09 and Fine particle hybrid mean score of 1.15. Their median scores were 0.79, 1.07 and 1.11 respectively.

Kruskal Wallis test was done and no statistically significant difference was found between the values of colorimeter among the three types of composite materials (p-value 0.062). However, there was a statistically significant difference found in the values measured after 2 months of experiment (p-value 0.062).

It can be noted from the results (Table 2) that Orcomer composite material experienced the most color change during the course of the experiment. Nanohybrid and fine particle hybrid composites also showed color change, however, this change was slight.

Table 1: Details of materials utilized in this study

Material	Product Name	Composition	Manufacturer
Ormocer	**Admira**	**OrmocerBis-GMA, UDMA,Glass Ceramic**	**Voco**
Nano Hybrid Composite	**Filtek Z250XT**	**Zirconia/silica (3 microns or less), BIS-GMA, UDMA, BIS-EMA, PEGDMA and TEGDMA**	**3M**
Fine particle hybrid composite resin	**Z 250**	**Bis-GMA, UDMA, Zirconium.**	**3M**
20% Carbamide Peroxide	**Opalescence**	**Carbamide peroxide, glycerine, sodium hydroxide, water, EDTA.**	**Ultradent Products**

Table 2: ΔE values of composite materials in Opalescence bleaching material

		Ormocer Mean±SD (Median)	Nanohybrid Mean±SD (Median)	Fine particle hybrid Mean±SD (Median)	p-value
Opalescence	Immediate	0.61±0.29 (0.56)	0.83±0.53 (0.88)	0.90±0.0.34 (0.93)	0.062
	2 months	0.84±0.42 (0.79)	1.09±0.81 (1.07)	1.15±0.23 (1.11)	0.019

DISCUSSION

This experimental study was designed to determine the extent of color change among different types of composite materials when exposed to 20% carbamide peroxide home bleaching agent. All three materials showed a change in shade when measured using a colorimeter. Turker et al (2013) conducted a similar study and found some results that were not so different to our findings. Although they measured the color change of 3 composite materials using 3 different bleaching agents; we merely measured the color change under 1 bleaching agent. However, the findings were similar in both studies, as Orcomer composite showed the highest color change over the course of the experiment.

Another investigation conducted by Rodrigues et al (2017) was done to assess any color change of composite materials when immersed in 35% bleaching agent. The findings revealed that there was change in color as far as nanohybrid resins were concerned. The difference to our study was the concentration of home bleaching system used. Another research by Rattacaso et al (2011) demonstrated a long term experiment on composites using 16% bleaching agent. A noticeable change in color was observed, which may be the result of prolonged and continuous exposure of composites to the bleaching agent. As compared to our study, the duration of experiment was shorter and not accelerated artificial aging was utilized.

It is important to note that this study was conducted in vitro, which may produce different findings as compared to an experiment done in vivo. Saliva may play an important role in determining the extent of color change in these composite materials. This is our main limitation of this study.

CONCLUSION

It can be concluded that Orcomer composite material showed a significant change in color as compared to nanohybrid and fine particle hybrid materials. This shows that the latest technology has resulted in producing composites which are resistant to color change as compared to previously manufactured composites.

CONFLICT OF INTEREST

There was no conflict of interest among the authors of this study.

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