

The Effect of Mouth Rinses On the Color Stability of A Nanohybrid Resin Composite Restorative Material

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Abstract:

Aim: The aim of this study is to evaluate the effect of alcohol and nonalcohol containing different mouth rinses on the color stability of a nanohybrid Resin composite restorative material.

Materials and Methods: A total of 50 samples of a nano hybrid composite material (Dimethacrylate oligomers Relight Technodent) were prepared and immersed in distilled water for 24 h. Baseline color values were recorded

using photoelectric colorimeter 113(Systronics) . Samples were then randomly distributed into five groups: Group I - distilled water (control group), Group II - Hexidine, Group III - Hiora-K, Group IV - Senquel AD, and Group V - Listerine . The postimmersion color values of the samples were then recorded, respectively.

Results: Significant reduction in the mean color value (before and after immersion) was observed in nonalcohol containing mouth rinses ($P < 0.001$).

Conclusion: All mouthrinses tested in the present in- vitro study caused a color shift in the nanohybrid resin composite restorative material, but the color shift was dependent on the material and the mouth rinse used. Group II (Hexidine) showed maximum color change.

Key words: Alcohol and nonalcohol containing mouth rinses ; Nanohybrid composites; Color.

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I. Introduction

A quest for an ideal and esthetically acceptable restorative material is probably as old as dentistry itself and patients consciousness of self- aesthetics has been enabled by the development of composite resins.

Currently, the improvements in adhesive dental technology and patients' esthetic expectations have resulted in a dramatic increase in the use of direct resin composite restorations for posterior teeth. Innovations are continually being made both in adhesive systems and also in adhesive restorative materials. These innovations have enabled clinicians to combine functionality and esthetics and have led to the introduction of "bulk fill" composites that can be applied as thick as 5 mm. These resin materials not only have enhanced curing properties and have provided low polymerization shrinkage, but are also more flowable and therefore result in better cavity adaptation . They require less chair time and a simpler application procedure. Generally, they are applied in two layers and only the second layer needs sculpting.

Discoloration of tooth-colored, resin-based materials may be caused by several intrinsic and extrinsic factors. Intrinsic factors involve the discoloration of the resin material itself, such as alteration of the resin matrix and changes in the interface of matrix and fillers. The resin matrix has been reported as being critical to color stability, and staining may be related to a high resin content and water absorption Color matching plays an important role in achieving good results. However, discoloration of composite resin restorations may occur from time to time, and this unacceptable color change may lead to replacement of these restorations.

Extrinsic factors for discoloration of resin composites include staining by adsorption or absorption of colorants from exogenous sources such as coffee, tea, nicotine, beverages, and mouthrinses.

The use of antimicrobial mouth rinses is an approach to limiting the accumulation of dental plaque, with a primary objective of controlling the development and progression of periodontal diseases and dental caries. However, frequent use of mouth rinses may have detrimental effects on oral and dental tissues. Despite the increased use of mouth rinses, research comparing resin composite color changes associated with use of mouth rinses is limited. The effect of alcoholcontaining, chlorhexidine-gluconate-containing, and hybrid mouth rinses on the color stability of glass ionomer, compomer, and microhybrid composite resin materials have been evaluated in previous studies.

The present in- vitro study was carried out to assess the effect of alcohol and nonalcohol- based mouth rinses on the color stability of a nanohybrid resin composite restorative material.

II. Materials And Methods

A nano hybrid composite material (Dimethacrylate oligomers Relight Technodent) treated with four mouth rinses having different resins ingredient were evaluated in this study. A2 shade was selected. Distilled water is taken as control group. Hexidine, Hiora-K, Senquel AD and Listerine are used as mouth rinses. For color evaluation photoelectric colorimeter 113(Systronics) is used.

Method: A total of 50 disc-shaped specimens (10 mm x 2mm) of resin composite were prepared according to the manufacturer’s recommendations. After placing resin composite into the mold, a polyester strip (Mylar strip; SS White Co., Philadelphia, PA, USA) was pressed onto the mold surface with a glass plate to obtain a flat surface. The composite was polymerized both from the top and the bottom for 20 s, in accordance with the manufacturer’s instructions using a LED light curing unit (Elipar Free Light, 3 M ESPE, AG, Germany, 1007 mW/cm²). The guide of the light curing unit was kept perpendicular to surface and the distance between the unit and the specimen was standardized using a 1 mm thick glass slide. All the specimens were stored in distilled water for 24 h at 37°C to ensure complete polymerization. The specimens were finished with 400-grit SiC paper and were polished with OptiDisc (Kerr, Orange, CA, USA) polishing discs, Opti shine (Kerr, Orange, CA, USA) polishing brushes and HiLusterPLUS Polishing System (Kerr, Orange, CA, USA) rubbers The specimens were kept in distilled water for 24h before baseline color measurements were taken.

Immersion of Specimens in Solutions:

To observe the color stability in various solutions after polishing, 50 specimens were divided into five subgroups (n=10) which will be treated with four different types of mouth rinses and distilled water (control). After that again all samples of each group incubation at 37°C for 7 days and again evaluate color value of each sample.

Color Measurements:

Twenty milliliters of distilled water was used to thoroughly rinse each specimen for 120 seconds. Each specimen was then blotted dry using a filter paper, and then subjected to color measurement. The initial color measurements for each specimen prior to immersion in any treatment solution were performed by photoelectric colorimeter 113(Systronics) and recorded as baseline measurements. After immersion into the treatment solutions, the second color measurements for each specimen were performed again. The total color difference ΔE^* was calculated for each Specimen.

Statistical Analysis:

The intragroup (pre- and post-immersion values) comparison of the mean color value of the samples was done by paired t-test. Color change between the groups was compared by performing one-way nonparametric ANOVA.

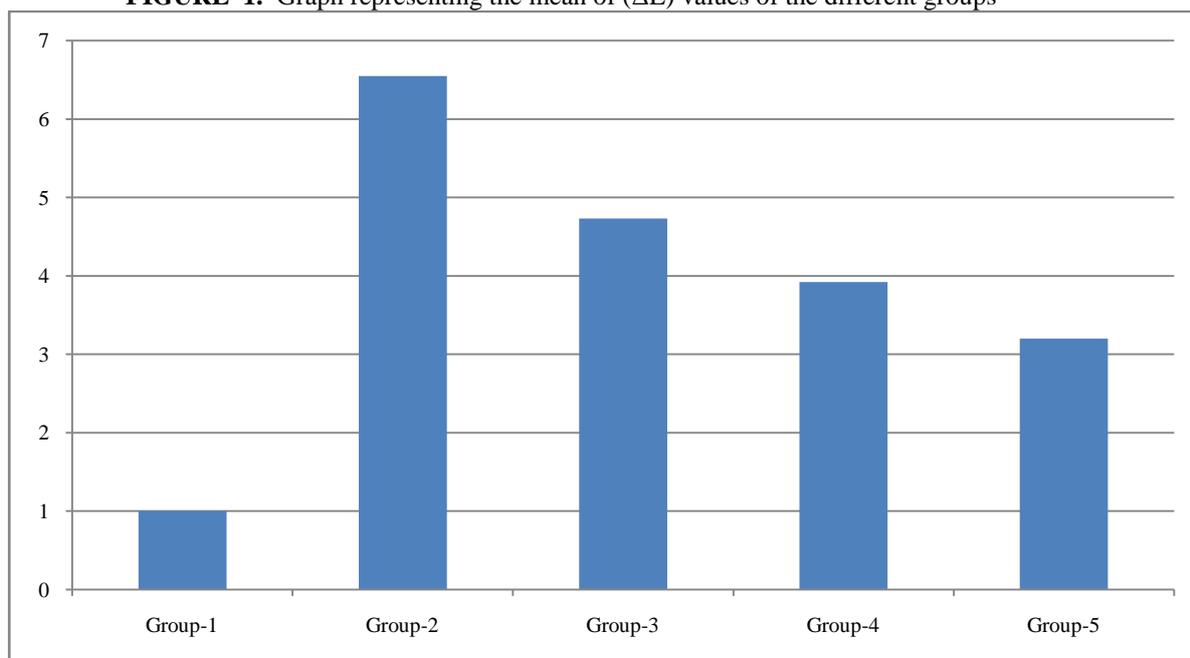
III. Results

The mean and standard deviations of the color change values (ΔE) for both resin composites after immersion in different solutions are summarized in Table 1 and graphically represented in Figure 1.

Table 1. Mean values and statistical analysis of the color difference (ΔE) values of the different groups

Group	Before immersion [Mean value]	After 1 day immersion [Mean value]	After 7 days Immersion [Mean value]	Variation
Group-1 Distilled water [Control group]	1.02	1.03	1.04	1.00%
Group-2 Hexidine	1.22	1.28	1.38	6.55%
Group-3 Hiora K	1.24	1.27	1.30	4.73%
Group-4 Senquel AD	1.19	1.22	1.25	3.92%
Group-5 Listerine	1.52	1.54	1.56	3.2%

FIGURE 1. Graph representing the mean of (ΔE) values of the different groups



IV. Discussion

The present study addressed the staining problem of direct adhesive restorative materials by commonly used types of mouth rinses. Staining can be evaluated by visual and/or instrumental techniques. One of these instrumental techniques is spectrophotometry and it is superior to visual evaluation as it leaves no room for subjective interpretation. It is able to measure the color change (ΔE) by comparing the values of before and after. In our observations, we preferred to use Vita Easy Shade because Kim *et al.* have reported that the reliability and accuracy values of this testing procedure was greater than 90%. The use of adhesive restorative materials especially in posterior teeth, has increased dramatically in recent years. However, insufficient material properties limited the success in high stress bearing regions.

Several manufacturers have developed posterior “bulk fill” resin composites. These new product were introduced to clinicians claiming that they had enhanced curing and physical properties and they could be applied into the cavity in thickness of 5mm. SonicFill is a single-step composite system that does not require an additional capping layer and possesses the advantages of both flowable and universal composites. This system is a combination of a hand piece that enables sonic activation and a resin composite.

Adhesive restorative materials should especially duplicate the natural tooth color. Thus, the performance of a dental restoration depends on its color matching ability and its stability. However, a major disadvantage of these materials is the discoloration that occurs after prolonged exposure to oral environment. Unacceptable color is an indication for the replacement of resin composite restorations. Accordingly, the color stabilities of posterior nanohybrid resin composite which are commonly used and commercially available restorative materials, were evaluated in this study.

In this study, samples of Group I (control group) when immersed in distilled water, showed color change, 1.00%. This change in color of the tested nanofilled resin composite restorative material was not perceptible. When samples of Group 2 were immersed in Hexidin mouthrinse (chlorhexidine-containing), the color change 6.55%, which is very close to the clinically standard value for color variations in dental materials. Samples of Group 5, when immersed in Listerine mouthrinse (alcohol-containing), showed color change 3.2%. Listerine has low pH with high alcohol content, in this study the color stability of the tested composite was not affected. Among the three non alcohol-based mouthrinses (Hiora K, Senquel AD, Hexidin) used in the present study, Hexidin showed maximum color change 6.5% in the nanofilled resin composite restorative material because chlorhexidine-containing mouthrinses having 0.2% chlorhexidine gluconate, affect the color stability of resin composites.

V. Conclusion

The present study appears to support the hypothesis that chlorhexidine-containing Hexidine mouthrinse having highest colour change and Alcohol-containing Listerine has Least.

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