

Effect of carbonated beverages on the color stability of bulk and flowable composite resin

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ABSTRACT

Tooth discoloration is considered as one of the most common dental problems among people, and in dentistry, the most common cases are claimed after the restoration. Therefore, in this research, we aim to evaluate the effect of carbonated beverages on the color stability of bulk and flowable composite resin. For the study, 12 composite disc samples were made using the standard dimensions of 10 mm diameter and 2 mm thick. To find the color stability, we used a VITA Easyshade spectrophotometer. We used two different composites of bulk fill and flowable composite resin; the composite brand we used was Tetric ecom plus; as an immersion medium, we used two different carbonated beverages, and the chosen beverages were Appy Fizz and 7Up. 24-h and 7-day postimmersion color stability was evaluated. In the results of postimmersion, we have found the Delta E value for 24 h immersion of flowable and bulk fill composite as 5.8115 and 7.4378, respectively; similarly, the Delta E value for 7 days immersion of flowable and bulk fill composite was 9.9559 and 10.1028, respectively. Using the independent “t”-test, we found that the significance is 0.633 and 0.328, which was statistically not significant. In the present study, when immersed in Appy Fizz juice and 7Up juice, bulk fill composite resins have shown greater discoloration when compared to flowable composite resin material. Thus, the flowable composite resin samples were more color stable.

Key words: Bulk fill composite, carbonated drinks, color stability, flowable composite, innovative measurement, spectrophotometer

INTRODUCTION

Composite resins are made using bisphenol A-glycidyl methacrylate, dimethacrylate monomers, a filler substance like silica, and a photoinitiator. Dimethylglyoxime is used

to provide specific physical qualities, such as flowability.^[1,2] The resin wears well without a filler, has a lot of shrinkage, and is exothermic.^[3] Exclusive resin blends compose the matrix of composites, such as tailored filler glasses and glass sintered production. Reduced polymerization shrinkage, enhanced compressive strength, and increased translucency are all benefits of the filler material.^[4]

Light-cured resin composites, known as bulk fill resin composites, can be placed in layers or increments of 4–5 mm in depth.^[5] The most notable advantage of these materials is initially the decrease in time needed for material insertion and polymerization, as well as the reduction in procedure

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sensitivity.^[6] Light polymerization necessitates careful attention. Bulk cure is not usually synonymous with bulk fill.^[7] Make sure the light tip is completely covering the material. Multiple exposures may be required to polymerize all of the composite resin materials.

The modification of color is largely linked to an individual's dental hygiene and eating habits, and it is a key quality that evaluates the success or failure of restorative treatment.^[8] Carbonated beverages, sometimes known as bubbly drinks, are carbonated fluids that contain dissolved carbon dioxide (CO₂).^[9] Fizz or efflorescence is caused by CO₂ dissolving in a liquid. CO₂ is commonly used in the procedure, which is done at a high pressure.^[10] Our team has a wealth of expertise and research experience, which has produced articles of the highest caliber.^[11-25] Therefore, in this research, we aim to evaluate the effect of carbonated beverages on the color stability of bulk and flowable composite resin.

MATERIALS AND METHODS

For the study, 12 disc samples were made using the standard dimensions of 10 mm diameter and 2 mm thick. All of the disc specimens were polymerized using light-emitting diode light-curing equipment with a 1000 mW/cm² light intensity and three 20-s exposure to the top. A 5 mm spacing was established between the light cure tip and the composite disc. We used two separate bulk fill and flowable composite resin composites; the brand name of the composite was Tetric ecom plus. With a low-speed handpiece, the surfaces were polished with Shofu brand composite polishing kit. As an immersion medium, we used two different carbonated beverages, and the chosen beverages were Appy Fizz and 7Up. These drinks were made in India. The color stability was measured using a spectrophotometer [Figure 1]. It was done for three times, namely before immersion, 24 h after immersion, and 7 days



Figure 1: Vita Easyshade Spectrophotometer

postimmersion. Before evaluating the color stability, the discs were rinsed in distilled water. L, A, and B value data were obtained from the spectrophotometer. Finally, Delta E values were calculated using the conventional formula.

RESULTS

We have estimated the mean value for Delta E in postimmersion for 24 h and 7 days for both flowable and bulk fill composite resin. Table 1 shows the mean, standard deviation, and test significance for 24 h of postimmersion, and Table 2 shows the mean, standard deviation, and significance of postimmersion 7 days. The 24-h immersion mean was found to be 5.8115 ± 1.4560 in the flowable-type group. The 24-h immersion mean was found to be 7.4378 ± 2.36388 in the bulk fill group. The 7-day immersion mean was found to be 9.9559 ± 6.56956 in the flowable-type group. The 7-day immersion mean was found to be 10.1028 ± 5.72514 in the bulk fill group. Figure 2 indicates the error bars for the mean values of comparing both 24 h and 7 days of postimmersion for flowable and bulk fill composite. Therefore, we have calculated the independent 't'-test using the Spss version 22.0 (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) and found that the significance $P = 0.633$ and 0.328 , which was statistically not significant.

DISCUSSION

The most significant and prevalent dental procedure in advanced dentistry is composite restoration. It is the most popular and appropriate treatment option, widely endorsed and recognized by both dental professionals

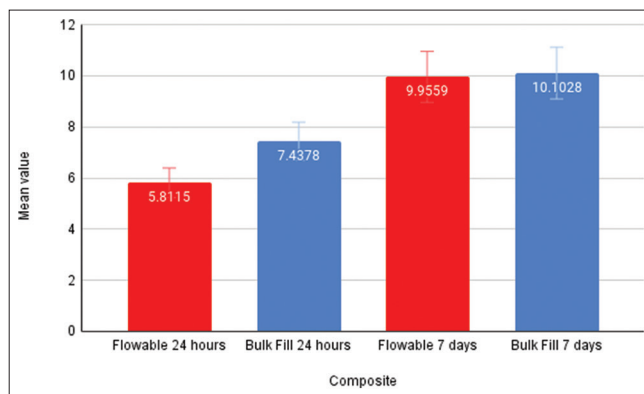


Figure 2: The mean of flowable and bulk fill composite for 24 h and 7 days, identified via independent "t"-test. X-axis is type of composite with the duration of immersion, Y-axis is the mean value. Red color indicates the flowable composite of both 24 h and 7 days postimmersion. Blue color indicates the bulk fill composite of both 24 h and 7 days postimmersion. The mean values of flowable composite for 24 h and 7 days are 5.8115 and 9.9559, respectively. Similarly, the mean values of bulk fill for 24 h and 7 days were 7.4378 and 10.1028, respectively. There was a significance of 0.633 for 24 h and 0.328 for 7 days postimmersion

Table 1: 24-h immersion of both flowable and bulk fill composite

Group	Mean	SD	Significance
Flowable	5.8115	1.45603	0.633
Bulk fill	7.4378	2.36388	0.633

SD: Standard deviation

Table 2: 7-day immersion values of both flowable and bulk fill composite

Group	Mean	SD	Significance
Flowable	9.9559	6.56956	0.328
Bulk fill	10.1028	5.72514	0.328

SD: Standard deviation

and patients around the world. The focus of this research is on two types of composite restorative materials that are often utilized in dentistry.^[26,27] The materials are all from the same manufacturer, and they come in two types: bulk fill and regular flowable composite. The Delta E value was determined to compare the color stability of composite materials. The selected carbonated beverages showed the most severe color changes, but the bulk fill resin had an increased color change than the flowable composite. Discoloration of tooth-colored normal and bulk fill resin composite materials can be a main cause of dental restoration replacement in cosmetic areas. This complication affects both patients and dentists.

A range of cosmetic restorative materials have already been examined *in vitro* for color stability. When compared to standard flowable fill composite, bulk fill resins show more discoloration, indicating that they are less color stable. Carbonated beverages have been shown in several tests to aid staining by weakening the resin matrix of composites. Furthermore, there are studies showing that carbonated beverages cause surface roughness on composite filled teeth.^[28]

There are also studies indicating the similar Chi-square value where $P = 0.239$, which is statistically not significant. Another article declares that there is a significant color difference in bulk fill and flowable composites resin when immersed in the carbonated beverages; they estimated that the Delta E value was >3.5 times which is considered a significant color change in the composite materials. These levels were considered to be clinically unacceptable and visually visible.^[29]

In this study, we have only considered a similar brand of two different composites which the results conclude only using those particular brand composites. Therefore, in further research, the need is to experiment the color stability of different composite materials for better restoration purposes. This study can help dental practitioners to use the adequate composite material for the restoration procedure,

which can satisfy several criteria among the patients and dental practitioners.

CONCLUSION

In the present study, when immersed in Appy Fizz juice and 7Up juice, bulk fill composite resins have shown greater discoloration when compared to flowable composite resin material. Thus, the flowable composite resin samples were more color stable.

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Conflicts of interest

There are no conflicts of interest.

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