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Research Article

Staining Potential of Different Coffee Products Available in the Saudi Market on Resin Based Composite Restoration

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Received: February 06, 2017; **Published:** February 20, 2017

Abstract

The aim is to evaluate the staining effect of different brands of coffee (available in the Saudi Market) on the Composite restorations.

40 extracted natural teeth were collected, (cleaning and polishing with a prophylaxis paste).

Then were prepared Class 1 Cavity (2 mm and 2 mm in depth/ width) afterwards it restored by based composite restorations. Four famous brands of coffee used in Kingdom of Saudi Arabia. Starbucks Black Coffee, Dunkin Donuts Black Coffee, Dr. Cafe Black Coffee, Tim Hortons Black Coffee included in our study. All samples were numbered from 1 - 40, then the color shade has taken using Easyshade Devise in Riyadh Colleges of Dentistry and Pharmacy, after that they divided into four groups according to the selected immersion solution (10 teeth in each Group), then we immersed these teeth in the selected solution for continuous 24 hours After removing the samples from the discolored solutions the were subjected to color measurement by the same Devise (Easyshade) to test the discoloration and all results were collected and subjected to statistical analysis.

Keywords: *Staining Potential; Coffee Products; Saudi Market; Composite Restoration*

Introduction

Tooth color plays an important role in the attractiveness of an individual smile. Therefore; dental stains can cause a major esthetic problem for patients [2].

Composite resins have been widely used in both posterior and anterior restorations since their first introduction to the dental field. When compared to the porcelain veneers and ceramic crowns, resin composite restorations are still plagued with several significant drawbacks despite continual improvements.

Besides polymerization shrinkage and secondary caries, plaque accumulation and color stability are some of their major problems [7].

Composite resins are among the tooth-colored restorative materials of choice for many dentists due to their high acceptance by patients and their excellent esthetic properties [4,6].

Composite resins are susceptible to various degrees of discoloration after prolonged exposure to the oral environment [5,8].

The structure of the composite resin have a direct impact to extrinsic staining. Discoloration of resin based composite restoration can caused by internal or external factors. Intrinsic factors involve alterations or changes in the chemical structure of the resin composites under physical and chemical conditions, whereas extrinsic factors cause staining from the absorption or adsorption of exogenous substances.

Dietary habits, such as large consumption of soft drinks, tea or coffee can contribute to external stain formation [1,12,13,15].

Some products can cause reduction in the microhardness of composite resin, leading to superficial degradation and staining [10,11].

The success of resin based composite restorations depends on the color stability in long term. Color match to the adjacent tooth is important over a long period of time [3,12,13].

The degree of color change varies from patient to patient based on oral hygiene status, consumption of different beverages [9].

Externally induced discoloration can be related to surface roughness, surface integrity, and the polishing technique [14].

Tooth surface discoloration by the deposition of extrinsic stains is currently treated by professional cleaning with scaling and polishing [15].

Intrinsic stains on composite restorations cannot be removed superficially, and might demand restoration replacement [15].

Discoloration can be evaluated by visual or instrumental techniques, color evaluation by visual comparison may not be a reliable method due to inconsistencies inherent in color perception and specification between observers, Instrumental techniques for color measurement include colorimetry, spectrophotometry and digital image analysis, where spectrophotometry is the most reliable technique in dental material studies [16].

The lighter shades of composite resins are likely to be subject to higher color degradation through the effects of environmental exposure to ultraviolet light [17].

The staining susceptibility of a composite resin may also be attributed to its filler type: Nanohybrid absorbs staining substances more easily than microhybrid [17].

Aim of the Research

Evaluation of the staining effect of different brands of coffee (available in the Saudi Market) on the Composite restorations.

Material and Methods

Ethical Approval

Study proposal was submitted to the research center of RCsDP and ethical approval was obtained.

The study was registered under the registration number FUGRP/2016/98.

Study Design: An *In vitro* study.

Sample Selection and Preparation

A sample of 40 extracted natural teeth (caries and stain free) were collected, (cleaning and polishing with a prophylaxis paste using a polishing brush).

Then we prepared Class V Cavity (2 mm in depth/ width) afterwards they restored by resin based composite restorations. Then samples was stored in isotonic 0.9% saline solution, to avoid dehydration.

Immersion Solution

Four famous brands of coffee used in Kingdom of Saudi Arabia.

Starbucks Black Coffee, Dunkin Donuts Black Coffee, Dr. Cafe Black Coffee, Tim Hortons Black Coffee were included in the study.

Staining Procedure

All samples were divided into 4 groups according to the selected immersion solution and numbered from 1- 40(10 teeth in each Group), the color shade was assessed before and after staining for each specimen by using CIELAB-system with a colorimeter (VITA Easyshade®Compact) Devise in Riyadh Colleges of Dentistry and Pharmacy.

We immersed these teeth in the selected solution and measure the shades in four readings (Before immersion, Directly 1 min after immersion, after 72 hours, after one week).

Color Measurement

As mentioned earlier, all samples subjected to color measurement by the same Devise (Easyshade) to test the discoloration and all results were collected and subjected to statistical analysis.

Statistical Analysis

The information and data from the study were entered into an electronic database (SPSS® for windows®V.18.0). Friedman test was used to detect statistically significant difference in the color change at different intervals. Statistical significance is set at $p < 0.05$.

Results

The average (median) values of color change of the specimens after immersion in the different types of coffee brands for the composite resin material used in the study are summarized in Table 1. After one minute of immersion, only Dr. Café coffee brand showed no difference in color change values than the baseline. However, after three days and one week immersion, all the four coffee brands showed difference in color change values.

Coffee brand	Before immersion	One minute immersion	Three days immersion	One week immersion
Dunkin Donut	B2	D4	B3	B4
Dr. Café	B3	B3	B4	A4
Starbucks	B2	A2	A3.5	B4
Tim Hortons	D2	C1	B4	C3

Table 1: *Average color change of the resin-based composite materials after immersion in the different type of coffee brands.*

One minute immersion

Dunkin Donut coffee brand showed greater staining values at “one minute” immersion and Dr. Café showed the least. Starbucks and Tim Hortons coffee brand showed staining values similar to each other.

Three days immersion

Starbucks and Tim Hortons showed similar and greater staining values at “three days” of immersion followed by Dunkin Donut and the least was Dr. Café coffee brand.

One week immersion

All the coffee brands except Dr. Café brand showed similar and greater staining values at “one week” after immersion.

Figure 1 to 4 shows color change of individual coffee brand at different time periods. Figure 5 indicates that the storage of specimens in different coffee brands and at different time periods causes a clinically diagnosable color change in comparison to the baseline.

There was a statistically significant difference in the color change at different intervals in all the coffee brands ($p = 0.000$).

Figure 1: *Average color change of the resin-based materials after immersion in Dunkin Donut coffee brand.*

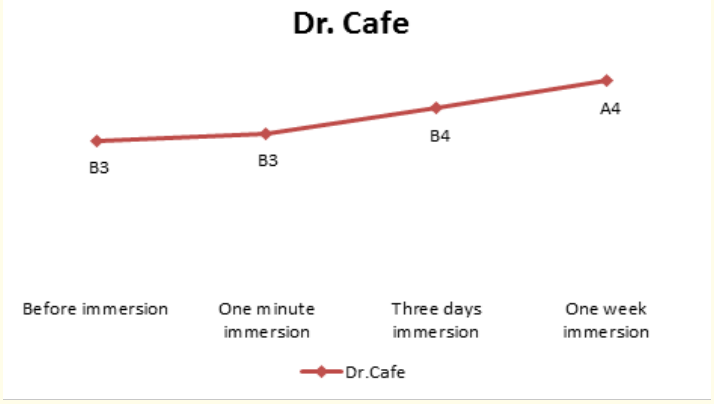

Figure 2: *Average color change of the resin-based materials after immersion in Dr. Café coffee brand.*

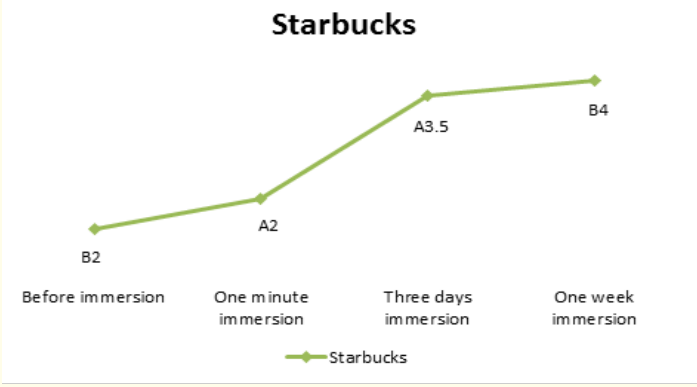

Figure 3: *Average color change of the resin-based materials after immersion in Starbucks coffee brand.*

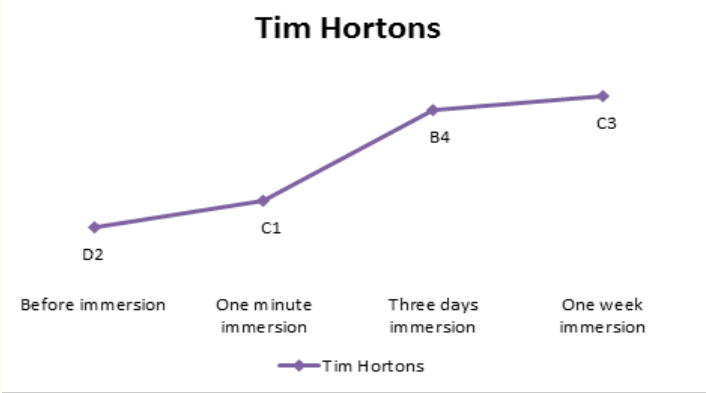

Figure 4: *Average color change of the resin-based materials after immersion in Tim Hortons coffee brand.*

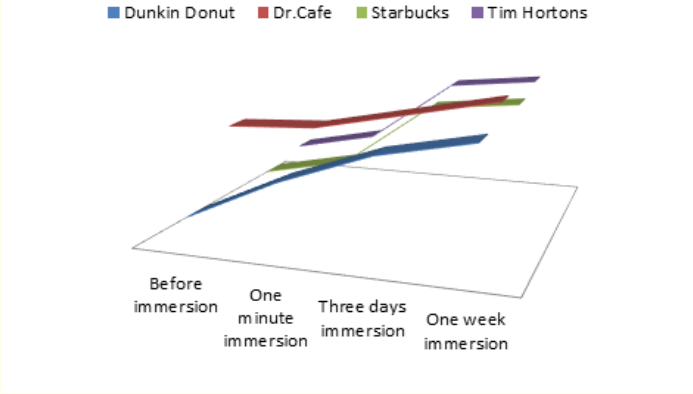

Figure 5: *Illustrates comparison between color changes in each group for different time durations.*

Discussion

In this study, we focused on the influence of staining of some coffee drinks that are available in Saudi Market on Composite Restorations, as the results showed that Dunkin Dunant Coffee had the worst staining effect in the first measurement while Dr. Café Coffee was the best in causing discoloration, the effect of the other two drinks was similar, this is might be because of the concentration of the caffeine in each coffee used, in the second measurement it was clear that there are changing in the degree of effect on the color of resin composite, Starbucks and Tim Horton drinks were the most effective drinks in staining then dunkindunat while Dr. cafe still the best one in this side, this is might due to the precipitation of the coffee particles on the composite surfaces.

In the third measurement all coffee drinks caused nearly the same staining effect except Dr. café which was always the least stained solution, so the most acceptable interpretation is that explain the concentration of each kind of coffee used and the ingredients of the discoloured drinks itself, in this side we are in consistence with [5,8] who revealed that Composite resins are susceptible to various degrees of discoloration after prolonged exposure to the oral environment.

Conclusion

With the limitations of our study we can conclude that all kinds of coffee cause staining on Composite Restorations, but may be some of them stronger to discolor the resin composite than others, so we can recommend to decrease the daily intake of those drinks as much as possible.

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Volume 8 Issue 2 February 2017