An Experimental Study to Assess the Effect of Disinfectants on the Shade Tab

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Abstract

Dentistry leaning towards esthetic restorations have made shade matching a crucial step in fabrication of restorations. It is important to ensure the restorations have the accurate shade, this warrants for a successful treatment. This study aims to evaluate the effect on the color of the shade tabs after disinfection. Shade tab guides from two different shade tabs were used and exposed to three different disinfectants. A Spectrophotometer analysis was done to check for the absorbance value after exposure to the disinfectants. The results showed maximum changes occurred after exposure to sodium hypochlorite. The changes observed increased with increase in the exposure time of the shade guides to the disinfectants. Thus, a standard protocol should be followed in clinics regarding disinfection of shade tabs and ensure a change in the shade guides after three to five years span.

***Key words** : Disinfection, Shade tab, Spectrophotometer, Absorbance value, Color*

Introduction

Shade matching ,a fundamental requirement in the fabrication of esthetic restorations depends on the observer completely which results in a successful treatment outcome. Most commonly used method of shade matching is still by comparing the shade tabs of commercially provided shade guides. Shade guides are non-invasive instruments, however, they may become contaminated with saliva during the process and appropriate decontamination procedures are recommended after each use. Disinfection of the shade guide holder or individual tabs is obligatory and any incorrect application will affect the physical and /or mechanical properties of materials undergoing disinfection.

Materials and Method

The Vitapan Classical Shade Guide used for shade matching of the Ceramic restorations and Esthete.x Shade Guide used for composite restorations were selected for use in the study because they are among the most widely used shade guides in Dentistry.

A total of 72 random samples,i.e, 36 shade tabs from Vitapan Classical Shade Guide and 36 shade tabs from Esthtex shade guide were selected. It was ensured to include all basic hues and a wide range of saturations and values.

The shade guide tabs were immersed in three commonly used disinfectants present in the Department such as Spirit (70% Isopropyl alcohol) (Advita lifesciences, India) , 5.2 % Sodium hypochlorite (Vishal Dentocare Private Limited, India) and Novacide (3% w/v PHMB [poly(hexamethylenebiguanide) hydrochloride], 10% w/v DDAC (Didecyl dimethyl ammonium chloride) (Bioshields, India).

Shade tab guides, three each, were immersed in these disinfectants for various intervals such as Seven days, Ten days, 24 hours, Four hours. The duration of exposure to the disinfectant was calculated by an average level of exposure. In the department, as each shade tab is disinfected for 30 seconds three times a day. Using this frequency, it was estimated a four hour exposure was

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equivalent to five months ten days exposure, 24 hours is approximately two years and eight months exposure likewise the estimate was calculated for exposure. In this study the maximum limit of exposure was approximately five years.

The solutions were replaced with fresh solutions everyday, as they get depleted with time.

Each solution along with the shade tab was placed in a plastic beaker with similar dimensions. Each beaker was marked so that it mentions the type of disinfectant present and duration of the exposure.

The spectorophotometric analysis was performed of the exposed shade tabs. Unexposed shade tab was used as a control for analysis. Before analysis each exposed shade tab was cleaned for 30 seconds under running water and 5mins in the ultrasonic cleaner to remove any residue of the disinfectant.

Results and Discussion

Currently, there has been an increase in knowledge and awareneness among patients leading to rise in demand for esthetic restorations. Shade matching has now become a crtical step and it should be followed with utmost care. According to American Dental Association (ADA), hospital level disinfectants which are tuberocidal in nature should be used for decontamination protocol of the shade guide holder and individual tabs. Water based agents should be used as the organic agents have the tendency to dissolve the plastic.[1]

The aim of this study is to investigate the effect of different disinfectants on the shade tabs exposed for different time periods.

The changes observed were expressed in terms of Absorbance value. Absorbance value is the measure of the quantity of light absorbed by a sample. Spectrophotometer passes a whole series of wavelengths of light and the difference in the light transmitted or absorbed is then evaluated. The change in absorbance value is a measure of change in the value of the shade tab guides.[2]

Data between the groups were analysed using unpaired t tests. Within the groups were analysed using repeated measures ANOVA. If ANOVA was significant LSD multiple pairwise comparison tests were used. SPSS software was used to analyse the data. $P<0.05$ was considered to be significant.

Table 1 : Comparison within Composite Shade tabs exposed to Sodium hypochlorite

	Mean	Std. Deviation	N
4hrs	.33433	.141797	3
24hrs	.44167	.123929	3
7 days	1.51467	.152504	3
15days	1.11233	.005033	3

F= 51.849 P=0.018 sig

Table 2 : Comparison within Composite Shade tab exposed to Novacide

	Mean	Std. Deviation	N
4hrs	.49900	.037041	3
24hrs	.25067	.076631	3
7 days	.93667	.794233	3
15days	.45567	.036143	3

F=1.667 P=0.326ns

Table 3 : Comparison within Composite Shade tab exposed to Spirit

	Mean	Std. Deviation	N
4hrs	.17533	.012858	3
24hrs	.46567	.154014	3
7 days	.57967	.101323	3
15days	.52733	.169119	3

F=14.229 P=0.058 ns

Table 4 : Comparison within Ceramic Shade tab exposed to Sodium hypochlorite

	Mean	Std. Deviation	N
4hrs	.39067	.059248	3
24hrs	.10133	.041741	3
7 days	.73767	.138868	3
15days	.11667	.073569	3

F=28.73 P=0.031sig

LSD multiple Pairwise Comparisons

(I) factor1	(J) factor1	Mean Difference (I-J)	P	95% Confidence Interval for Difference	
				Lower Bound	Upper Bound
4hr	24hrs	.289*	.038	.038	.540
	7 days	-.347*	.018	-.550	-.144
	15 days	.274	.070	-.055	.603
24hrs	7 days	-.636*	.026	-1.084	-.189
	15days	-.015	.513	-.099	.068
7 days	15 days	.621*	.036	.101	1.141

*. The mean difference is significant at the .05 level.

Table 5 : Comparison Within Ceramic Shade tab exposed to Novacide

	Mean	Std. Deviation	N
4hrs	.38067	.034948	3
24hrs	1.04100	.882143	3
7 days	.28533	.141931	3
15days	.37833	.090224	3

F=2.208 P=0.275 ns

Table 6 : Comparison within Ceramic Shade tab exposed to Spirit

	Mean	Std. Deviation	N
4hrs	.99567	.793553	3
24hrs	.20433	.167527	3
7 days	.46000	.265684	3
15days	.06733	.042618	3

The results showed that on exposure to sodium hypochlorite, maximum change was seen in the absorbance value of the shade tab after 15 days exposure.

The changes observed with exposure to Novacide were also significant, although the effects were lower in comparison to Sodium hypochlorite.

Spirit (70% Ethyl Alcohol) did not cause any significant changes in the absorbance values. This is in contrast to the study done by Alshethri,who reported a greater color change in denture teeth treated with 70% alcohol. This difference can be attributed to the use of mixture of ethanol and isopropanol in the study.[3]

It was also observed that with an increase in the duration of exposure there was increase in the changes seen in the absorbance values, regardless to the disinfectant solution used.

Huang et al. (2014) conducted a study to evaluate the effect of different disinfectants on shade guides and concluded that there was significant difference in the color of the shade tabs. The differnec onserved was dependent on the type of disinfectant used. These findings were consistent with the findings of this study. [4]

According to Table 1-6, it was observed that more early and definite changes were seen in the composite shade tab in comparison to the ceramic shade tab. Similar changes were observed in the study conducted by Nijhawan et al. were they evaluated the effect of four disinfectants on the color of two different shade guides. [5]

Pohjola et al., evaluated standard shade guide for color change after disinfection in which they observed a statistically significant increase in the value and chroma of the shade tabs subjected to disinfection with Cavicide after 2 and 3 years of simulated treatment. Similar results in the measure of absorbance value were seen in the current study on exposure to Novacide.[6]

With respect to most of the studies performed prior the results were in approximation to the current study.

Conclusion

In this study following conclusions can be drawn :

- Regular disinfection after a period of three to five years of the shade tab guides has shown to cause change in the value leading to inaccuracies in the shade matching process.

In the current study,the exposure time and the type of disinfectant used are the factors attributing to the changes observed. With increased exposure to the disinfectant, amount of change in the absorbance value was more. The maximum changes observed was with exposure to 5.2% Sodium Hypochlorite. These changes will begin as early as two years of time span and will gradually reach to a higher level within a span of five years or more. Thus, it is recommended for the older shade tabs to be changed after a particular time so as to avoid inaccuracy in the shade matching procedure.

The material of the shade tab guides can affect the amount of change in the value. The observed changes in the absorbance value of the shade tabs were higher and detected earlier in the Composite shade tab in comparison to the Ceramic shade tab.

Ethical Clearance- Taken from ethical committee

Conflict of Interest – Nil

Source of Funding- Self

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