

Research Article



Comparison of Whitening Effect on Teeth with Different Types of Commercially Available Bleaching Agents.

Vidulasri.N¹, Dr. Jayalakshmi²
(UG Student)¹, (Senior lecturer)²

Department of conservative dentistry, Saveetha dental college and hospitals,
162, Poonamalle High Road, Chennai 77, Tamilnadu, India.

*Corresponding author's E-mail: ritusri41@gmail.com

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ABSTRACT

The aim of the study is to compare the whitening effect on teeth with different types of commercially available bleaching agents. Twenty extracted teeth were selected. The teeth were stained using turmeric and coffee for 2 days. The resultant discolored teeth were washed in distilled water. Baseline color for the teeth was evaluated using a VITA Classical shade guide before they were bleached. Teeth were divided into 4 experimental groups and into two subgroups A and B. Two commercially available bleaching agents were used POLA office Plus (37.5% hydrogen peroxide) and FLORENCE (35% hydrogen peroxide). ANOVA test was used to calculate the level of significance among the tested groups. Intra group comparison was done using Paired t-test to see the significant change in bleaching at 0, 7, and 14 days for each group. The intergroup comparison was done using one way ANOVA with post hoc Tukey's modification to see efficacy of the groups tested. On group comparison using Anova test there was statistically significant shade change at 7 and 14 days in all the experimental groups. On inter group comparison there was maximum bleaching efficacy with group III & IV with shift of 5 shade tabs and Group I & II with a shift of 4 shade tabs. On intra group comparison there was shade change on (0-7), (0-14) and (7-14) days on all experimental groups which was statistically significant.

Keywords: In office bleaching, hydrogen peroxide, Tooth discoloration, Staining.

INTRODUCTION

Because of this, the treatment for discoloration of non-vital teeth has become increasingly important. Tooth bleaching can be performed externally, termed vital tooth bleaching, or intracorally in root-filled tooth, called non-vital tooth bleaching¹. Contemporary tooth whitening (tooth bleaching) systems are based primarily on hydrogen peroxide (H₂O₂) or one of its precursors, carbamide peroxide². The efficacy of bleaching depends on the type of stain and its etiology, it also depends upon type of the bleaching agent, its concentration and the duration of application³. They act by bleaching the chromogens within the dentine, thereby reducing the body colour of the tooth and are often used in combination with an activating agent such as heat and/or light¹. But its use has been associated with few undesirable consequences such as external cervical root resorption, excessive peroxide diffusing into the periradicular tissues, possibly through cemental defects⁴. Sodium perborate is one of the commonly used intracoronal bleaching agents, which can be used alone with distilled water or in combination with H₂O₂. When used with distilled water it does not produce any adverse effect but takes long time to produce appreciable color change⁵. Since there are various formulations of bleaching agents available commercially in different concentrations, it would be desirable to find out an agent with a lower peroxide concentration causing least complications and providing better aesthetic outcome⁶.

MATERIALS AND METHODS

Twenty extracted tooth were selected. A gauze soaked with a solution of sodium hypochlorite was used to remove any soft tissue covering the root surface. The teeth were stained using turmeric and coffee for 2 days. The resultant discolored teeth were washed in distilled water.

Baseline color for the teeth was evaluated using a VITA Classical shade guide before they were bleached. The shade guide was arranged by value order from lightest to darkest as determined by the manufacturer and a score was assigned.

Teeth were divided into 4 experimental groups and into two subgroups A and B. Two commercially available bleaching agents were used POLA office Plus (37.5% hydrogen peroxide) and FLORENCE (35% hydrogen peroxide). Subgroup A was treated with 37.5% hydrogen peroxide and Subgroup B was treated with 35% hydrogen peroxide. The tested bleaching agents were applied on the subgroups as follows.

Subgroup-A

Group-I: coffee stained teeth – 37.5% hydrogen peroxide

Group-II: turmeric stained – 37.5% hydrogen peroxide

Subgroup-B

Group-III: coffee stained – 35% hydrogen peroxide

Group-IV: turmeric stained – 35% hydrogen peroxide



In group, I to IV, the bleaching agent was applied externally to the buccal surface of the tooth and kept aside for half an hour, and then washed using distilled water. The color of each tooth was evaluated using the VITA classic shade guide according to assigned score under day light. Evaluation was performed at day 0 before the application of bleaching agent and at 7 and 14 days after the application of bleaching agent. The teeth were wrapped in gauze soaked with distilled water and kept throughout the experiment.

STATISTIC ANALYSIS

ANOVA test was used to calculate the level of significance among the tested groups.

Intra group comparison was done using Paired t-test to see the significant change in bleaching at 0, 7, and 14 days for each group. The intergroup comparison was done using one way ANOVA with post hoc Tukey's modification to see efficacy of the groups tested.

Table 1: Vita classic shade guide arranged in order of value and the assigned score

VITA Shade to Numerical Value Conversion Chart															
B1	A1	B2	A2	D2	C1	C2	D4	A3	D3	B3	A3.5	B4	C3	A4	C4
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 2: Mean and standard deviation using ANOVA test results for group comparison

Groups	Time Intervals		
	0 Days	7 Days	14 Days
GROUP-I Coffee stained (35% hydrogen peroxide)	11.3± 0.78	9.6± 0.81	7.5±0.79
GROUP- II Turmeric stained (35% hydrogen peroxide)	11.5± 0.64	10±0.73	7.9±0.56
GROUP-III Coffee stained (37.5% hydrogen peroxide)	10.3± 0.90	7.9± 1.30	5.8± 0.44
GROUP-IV Turmeric stained (37.5% hydrogen stained)	1.1± 0.74	9±1.27	6.3±1.13
p-value	0.112	0.044*	0.002*
Interference	NS	S	S

*mean difference significant at the level of 0.05; S- Significant NS- Not significant

Table 3: The intergroup comparison

Sample	Group	Comparison Group	P-value
7 DAYS	Group-II Tumeric stained (35% hydrogen peroxide)	Group- III coffee stained (37.5% hydrogen peroxide)	0.040*
	Group-I Coffee stained (35% hydrogen peroxide)	Group-III Coffee stained (37.5% hydrogen peroxide)	0.016*
14 DAYS	Group-II Tumeric stained (35% hydrogen peroxide)	Group-III Coffee stained (37.5% hydrogen peroxide)	0.004*
	Group-IV Tumeric stained (37.5% hydrogen peroxide)	Group-II Tumeric stained (35% hydrogen peroxide)	0.028*

*mean difference significant at the level of 0.05



Table 4: shows intragroup comparison

Groups	Days	Mean \pm Stdev	P-Value
Group-I Coffee stained (35% hydrogen peroxide)	0-7 days	1.7 \pm 0.77	0.007*
	0-14 days	3.8 \pm 0.59	0.000*
	7-14 days	2 \pm 0.22	0.000*
Group- II Tumeric stained (35% hydrogen peroxide)	0-7 days	1.6 \pm 0.31	0.000*
	0-14 days	3.6 \pm 0.16	0.000*
	7-14 days	2. \pm 0.21	0.000*
Group-III Coffee stained (37.5% hydrogen peroxide)	0-7 days	2.4 \pm 0.56	0.001*
	0-14 days	4.4 \pm 0.63	0.000*
	7-14 days	2 \pm 0.93	0.008*
Group-IV Tumeric stained (37.5% hydrogen peroxide)	0-7days	2 \pm 0.59	0.001*
	0-14 days	4.8 \pm 0.43	0.000*
	7-14 days	2.7 \pm 0.44	0.000*

*mean difference significant at the level 0.05

DISCUSSION

The present study was conducted using two commercially available bleaching products FLORENCE (35% hydrogen peroxide) and POLA Office plus kit (37.5% hydrogen peroxide) to compare, evaluate their bleaching efficacy and to find out an agent with a lower peroxide concentration causing least complications and providing better aesthetic outcome.

Hydrogen peroxide has a whitening effect because it can pass easily into the tooth and break down complex organic molecules. Less complex molecules that reflect less light lead to a reduction or elimination of the discoloration of both the enamel and the dentin. In-office bleaching generally uses relatively high levels of whitening agents, for example 25–35% hydrogen peroxide containing products, for rapid treatments. As in this study we used 35% and 37.5 % hydrogen peroxide (in office bleaching products) to provide better results on discolored teeth.

In our study, external application of the bleaching agent was carried out by applying it on the buccal surfaces of tooth for half an hour as it is an average recommended time by most manufacturers like (21% CP Perfecta premier, 35% Pola office plus, Ultrawhite system, Ammdent) and it simulates the clinical in office application time of bleaching agents. Similarly, in a study by Settembrini et al 9 (2014), the study was to remove intrinsic discoloration in anterior teeth, using the method of inside/outside bleaching.

Results of this current study showed that Both POLA Office plus and FLORENCE showed similar results with statistically significant difference on their bleaching effect.

Earlier studies 6,11 have shown that 35% CP was equally effective as 35% H₂O₂ on artificially discolored tooth, it was also shown that Lower concentrations of carbamide

peroxide took longer time to whiten the teeth but eventually achieved the same result as higher concentrations.

In this study a statistically significant shade change using both FLORENCE Kit (35% H₂O₂) on (Group I & II) and POLA Office plus (37.5% H₂O₂) on (Group III & IV) was observed. Similarly, in a study by Carrasco et al. (2003) 7, was to assess quantitatively dentin permeability of pulpless teeth after intracoronal bleaching therapy with three different agents and found out that 37% Carbamide peroxide had a high increase in dentin permeability as compared to sodium perborate associated with 20% Hydrogen peroxide and 27% Carbamide peroxide.

In the present study, there is significant shade change at 7th and 14 days, with maximum shade change from 7- 14 days. It is also showed that at 14 days it showed maximum bleaching efficacy with Group III and VI with approximate shift of 8 shade tabs and in Groups I and IV with a approximate shift of 7 shade tabs 6. In our study, Group III & IV (POLA Office plus) showed shift of 5 shade tabs and Group I & II (Florence) showed shift of 4 shade tabs. Similarly, in a study by Rakesh Mittal.in (2015) 6 was to evaluate and compare the efficacy of commercially available three bleaching agents when used internally or by internal-external method in non-vital teeth, and found out that there is statistically significant shade change at 7 and 14 days in all the experimental groups (p < 0.001) with maximum shade change at first 7 days.

In our study shade evaluation was done till 14 days to find out the bleaching efficacy of the products. Similarly, in a study by Leonard RH et al (1998) 11 was to use different concentrations of carbamide peroxide for bleaching teeth and stated that shade evaluation was done only till 14 days and it could be postulated that an extended bleaching time with a lower peroxide concentration would yield similar results as that of a higher concentration Carbamide peroxide.



However, it is also stated, from the present study that though POLO Office plus (37.5 % hydrogen peroxide) had slight increase in bleaching efficacy than FLORENCE (35% hydrogen peroxide), both produced almost same results with no statistically significant result.

CONCLUSION

From the above study, we conclude that, Both POLA Office plus and FLORENCE shows that there were no statistical significant results on their bleaching effect.

On intra group comparison there was shade change on (0-7), (0 -14) and (7-14) days on all experimental groups which was statistically significant.

RESULTS

In Table 2 there was a statistically significant shade change at 7 and 14 days in all the experimental groups.

Table 3 shows that there was no statistical significant result on the bleaching aspect at 0th day when the intergroup comparison between turmeric and coffee staining when bleached with POLO Office plus and FLORENCE ($P>0.05$).

On 7th day - There was statistical significant result on the bleaching aspect at 7th day on comparison between turmeric (treated with Florence kit) and coffee stained (treated with POLA Office kit) ($P<0.05$).

On 14th day - There was statistical significant result on bleaching aspect on the 14th day when the intergroup comparison between turmeric and coffee staining when bleached with (Florence) and (POLO Office plus) ($P<0.05$).

There was also maximum bleaching efficacy with group III & IV with shift of 5 shade tabs and Group I & II with a shift of 4 shade tabs.

Table 4 on Intra group comparison showed that there was shade change on (0-7), (0 -14) and (7-14) days on all experimental groups which was statistically significant.

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