

THE TOOTH WHITENING EFFICACY OF THREE DIFFERENT IN- OFFICE BLEACHING SYSTEM AND EFFECT ON ENAMEL MICROHARDNES. "AN IN-VITRO STUDY"

Vivek Kumar Pathak¹, Saurabh Mankeliya², Kaushal Singh³, Kanchi Jain⁴, Ashish Sharma⁵, Ashish Kushwah⁶

Private Consultant^{1,2}, Post Graduate Student^{3,4,5,6}

1-2- Gwalior, Madhya Pradesh, India

3-5- Post Graduate Student, Department Of Conservative Dentistry And Endodontics, Maharana Pratap College of Dentistry & Research Centre, Gwalior
6-Department of Orthodontics, Teerthankar Mahaveer Dental College & Research Centre, Moradabad, Uttar Pradesh, India

Abstract

The aim of this study: The aim of this study was to check out effects of the concentrations(hydrogen Peroxide) on stained teeth in bleaching procedure and Knoop microhardness.

Material Methods: A total 45 freshly human extracted canine teeth were selected for the study. Three groups of canine 10 teeth were treating with various peroxide concentration as follows (Opalescence Boost PF, HP 40%)Group A, (Pola office plus, HP 37.5%) Group B and Group C (Whiteness HP, HP 35%). 5 samples (enamel) were prepared from all groups, and investigate microhardness changes on enamel before and after 15 minutes bleaching.

Result: There was significant p-value found among groups (A, B and C) as the p-value was 0.037 which less than 0.05. There was no significant difference found among groups KHN after Bleaching (A, B and C) as the p-value was 0.815 which greater than 0.05.

Statistics: In this study, the product was compared to a difference in shade guide and microhardness of enamel using repeated measures Analysis Of Variance (ANOVA) and LSD POST HOC TEST is significant at the 0.05 level.

Conclusions: Higher concentration of hydrogen peroxide result in better bleaching. The chemically activated treatments were more stable than Light activated materials. The effect of all three in-office bleaching systems on enamel microhardness was not significant.

Keywords: bleaching, Enamel, Microhardness.

INTRODUCTION

When arrangements of oral health of patients smile enhancing procedures are the part of it, helps in chewing food, talk, and no feeling of shame socialize, distress. Professional tooth bleaching offers the clinician enhance patient esthetics.¹ Tea is a standout amongst the most widely drinks in the world, second just to water. Tea is winding up progressively well known and patients are worried about the impacts of recoloring on their dentition.² Tooth staining may fluctuates and complex but generally two types intrinsic or extrinsic when classify. Extrinsic staining arises when tooth pellicle layer penetrated by outer chromogens (inside tooth surface).³ Cosmetic problems induce by tooth discoloration and the esthetic dental profession expenses are too high to enhance general health of patient. To manage discoloured teeth like surface stain removal, tooth whitening or bleaching procedures and dental operative techniques such as composite veneers and crowns preparation for completely hidden discoloration.⁴ Bleaching treatment is a technique for reestablishing the shade of stained vital teeth and has been related with peroxide concentration and bleaching time. Now a day's simple, conservative method used to enhance the stylish appearance of patients is bleaching because of an increased interest for tooth whitening.⁵

The main aim of this study was to check out effects of the concentrations(hydrogen Peroxide) from 35%- 40% had on the tooth whitening process and Objectives of this investigation- 1) assess and study the efficacy by visual assessment (shading change)of three chemically-activated in-office bleaching materials of enamel. 2) Investigated the enamel microhardness by impact of the three bleaches.

MATERIAL & METHOD

A 45 freshly extracted canine was chosen and inundated in 0.9% w/v normal saline. Before starting procedure, clean all teeth and analyzed for the nonattendance of illness, deformities, and fracture or other. The roots were evacuated, and independently submerged in a standardized tea solution all specimens for a day by Sulieman and others described.⁴ 2gm of tea (extra strong black tea) was boiled in 100 ml of distilled water for 5 min to make solution and teasieved after boiling. Outer discoloration of teeth was removed with the help of polishing paper before staining. Human teeth were implanted in plaster of Paris and 10 teeth each randomly separated into three groups as follows: A-: Opalescence Boost PF (chemically-activated bleaching system 40% Hydrogen Peroxide, Ultradent, Inc, South Jordan, UT, USA), B-: Pola Office Plus (Hydrogen Peroxide 37.5%SDI Limited Bayswater, Victoria, Australia), C-: Whiteness HP (Hydrogen Peroxide 35% FMG dental products, Joinville, Brazil, SA). During procedure, oral

side lying in 0.9% w/v sodium chloride and bleaching cycles (15-minute) on the facial side. After every cycle, 0.9% w/v sodium chloride was used to clean, shading were outwardly assessed and reshaded till that desire outcome accomplished. In this investigation, a difference in Vita shade six tabs compared to baseline tabs. Reason behind that, the shade tabs were arranged in brightening from 1 to 16 (B1 to C4) (Table 1).¹⁶ Two different techniques were used to accomplishing the shades, for teeth:

- Vita shade guide (Vita, Zahn fabrik, Germany) used for visual assessment. One researcher led immediately visual assessment after bleaching cycle. For assessment, dark black container was used to mimic dark foundation look like oral cavity. Assessment of shade happened in photography studio, where the light was steady constantly. (Table 1)

B	A	B	D	A	C	C	D	A	D	B	A	B	C	A	C
1	1	2	2	2	1	2	4	3	3	3	3	4	3	4	4
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 1: The Vita Shade Guide with 16 Shades Ranked From the Lightest Color on the Left to the Darkest Color on the Right

Assessment digitally by Photoshop 7.0 (Adobe Systems, Inc, San Jose, CA, USA). Two pictures were captured with a Nikon 3100 Camera in similar light intensity previously and immediately after the blanching cycle for digital evaluation. For the visual assessment, the mean number of application per group required to accomplish the six shade tab changes was calculated from the number of cycles per group. Both mean values were used for the statistical analysis. Fifteen extra enamel-dentin samples from freshly extracted canine were prepared and implanted in self cure resin. The enamel surfaces of the samples were flattened, then polished up to 4000 grit in a lapping and polishing unit with water irradiation. The samples were randomly divided into three groups (n=5). They were bleached for 15 minutes utilizing the bleaching procedure described for the different groups. Five Knoop micro hardness (Semi Automatic Micro-Hardness Tester Mvh- S Auto) estimations were made on the top surface of each sample before and after the bleaching procedure using a load of 0.981 N. For the statistical analysis of micro hardness, the mean values of the five measurements (significance level of 0.05).

RESULTS

As per visual assessment of shade, teeth from Group A required 1.70 cycles, Group B required 3.80 cycles and the teeth in Group C required 3.10 cycles so as to accomplish the ideal colour. (Table2, Figure1) Analysis of variance shows significant difference found between Group A and Group B as the P- value is 0.012 which is

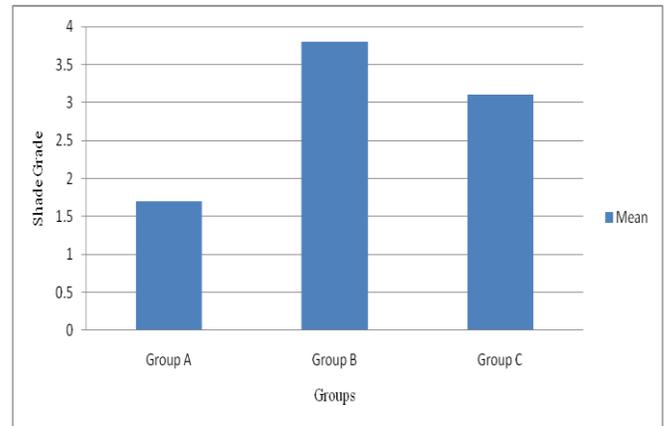


Figure 1 – Graphical Representation of Groups after Bleaching

	N	Mean	Std. Deviation
Group A	10	1.7000	1.56702
Group B	10	3.8000	1.75119
Group C	10	3.1000	1.91195
Total	30	2.8667	1.90703

Table: 2 Descriptive Statistics of Groups after Bleaching Shade Grade

	Sum of Squares	df	Mean Square	F	P – value
Between Groups	22.867	2	11.433	3.737	0.037
Within Groups	82.600	27	3.059		
Total	105.467	29			

*The mean difference is significant at the 0.05 level

Table 3: ANOVA Table of Groups after Bleaching

	N	Mean	Std. Deviation
group A	5	293.2000	15.44992
group B	5	286.6000	19.50128
group C	5	290.6000	13.39029
Total	15	290.1333	15.36167

Table: 4 Descriptive Statistics of Groups KHN after Bleaching

less than 0.05 (Table3) and LSD Post Hoc Test shows significant difference found between Group A and Group

C as the P- value is 0.085 which is more prominent than 0.05.(Table5)

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	P- value	95% Confidence Interval	
					Lower Bound	Upper Bound
Group A	group B	-2.10000*	.78221	.012	-3.7050	-.4950
	group C	-1.40000	.78221	.085	-3.0050	.2050
Group B	group A	2.10000*	.78221	.012	.4950	3.7050
	group C	.70000	.78221	.379	-.9050	2.3050
Group C	group A	1.40000	.78221	.085	-.2050	3.0050
	group B	-.70000	.78221	.379	-2.3050	.9050

*. The mean difference is significant at the 0.05 level.

Table: 5 LSD Post Hoc Test of Groups after Bleaching

There was no significant difference found between Group B and Group C as the P- value is 0.379 which is greater than 0.05. For micro hardness, demonstrated that there was no significant difference found among groups KHN after Bleaching (Group A, Group B, and Group C) as the p-value was 0.815 which was greater than 0.05.(Table 4, Figure 2)

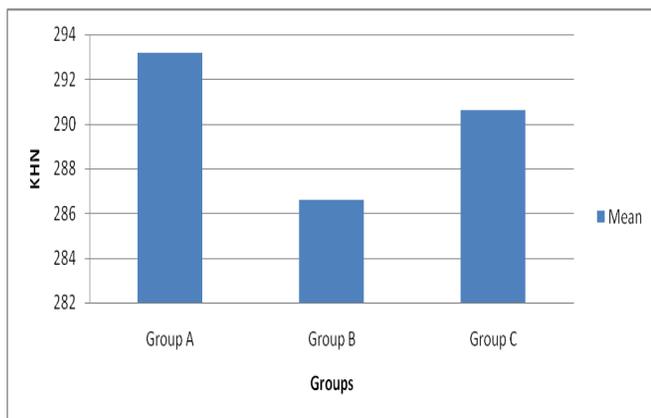


Figure 2 – Graphical Representation of Groups KHN after Bleaching

DISCUSSION

This study shows, three different systems of bleaches were tried and taught about effectiveness and impact on tooth micro hardness. Staining by tea utilizing a procedure connected in a few past investigations.^{6,7} Tea picked in light of the fact that it had been utilized in various past analyses estimated under spectrophotometry depends on reproducibly achieved stain improvement.⁴ However, chromogen of tea may address on the premise that inherent staining of teeth is brought about by other chromogens, except when dentin becomes uncovered.³Teeth roots were removed for allow in gin filtration of the chromogen into dentin. According to few literatures tea colour utilize like chromogen, can create

inherent stains.^{6,4} Present outcomes, when specimen bleached by Opalescence Boost PF (40% HP, Ultra dent Products, Inc, South Jordan, UT, USA) required less number of cycles to achieve expected esthetic consequence Vita colour (shadetabs) compared with two groups (B,C). A significant difference was just found between Opalescence Boost PF (40% HP, Ultradent Products, Inc, South Jordan, UT, USA) and Pola Office Plus (37.5% HP SDI Limited Bayswater, Victoria, Australia). No significant difference could be seen between the Pola Office Plus (37.5% HP SDI Limited Bayswater, Victoria, Australia) and Whiteness HP (35% HP FMG dental products, Joinville, Brazil)system. There is very little information in the writing regards colour stability among different bleaching products and methods after bleaching. the brightening impacts of different peroxide concentration bleaches (35% HP, 10% CP) tried by Luk and others with light sources.² Following treatment outcomes were progressively influenced by light activation and result after one week of bleaching, agreed without come of present investigation . Luk and others thought about colour (shade) alters one week after result can easily compare to prompt shading alters for surveying bleaching viability.⁸Their outcomes concurrence with observations of current investigation, which demonstrate impacts of light initiation could not appear steady for long time. A serious shading backslide is referenced in concentrates by Zekonis and others,⁹ Al Shetri and others¹⁰ who discovered shading change with an extreme relapse over time after chemically-activated bleaching. Further research is important to explore shading relapse when light-activated bleaching is utilized. The CIE Lab system is enough identified with human eye shading observation in every one of the three elements of colour space. That was consider by Polydorou, the three bleaching systems did not differ significantly in terms of the L*a*b* values at every one of the three distinct focuses in time that were tested.⁵In the current investigation, the digital pictures were taken after the bleaching process for the visual assessment of the shade. Sulieman and others additionally demonstrated that the utilization of light activation of the bleaching agent has valuable impacts. The significant temperature increment that is delivered when light activation units are utilized⁷makes an additional issue, which centers around blanching with light activation and conceivable pulpal damage. Advantages and disadvantages of this method were difficult to standardize in this way. KHN of enamel micro hardness after Bleaching cycles (A, B, and C) significant changes not found among groups. Rodrigues and othersinvestigate,¹¹ that bleaching with various concentrations of carbamide peroxide shows significant changes and proposing demineralization by bleaching products.¹² Various studies^{13,14} not found surface micro hardness significant changes after bleaching cycles. In the outcomes of the current investigation, micro hardness increase was not found, which isn't in concurrence with de Oliveira and others,¹⁵ who detailed that bleaching could even significantly high enamel micro hardness

during *in vitro* bleaching treatment. Interesting arrangement of blanching materials utilized in the diverse examinations affect the outcomes. Also, trial configuration utilized, as appeared by Justino and others¹⁶ could influence the outcomes. The unfavorable impacts of bleaching on enamel were not seen in the experimental *in situ* but were design evident in specimens bleached *invitro*.

Conclusion

In this present investigation the visual colour shade assessment of enamel after bleaching with Opalescence Boost PF (HP 40%) Ultradent indicates preferable shade changes over Pola Office Plus (HP 37.5%) SDI and Whiteness HP (HP 35%) FMG. The impact of all in-Office bleaching productson enamel microhardness was not significant.

References

1. Bernie KM. Professional whitening. Dental Abstracts. 2013; 58:4(198-200).
2. LeeRJ, BayneAet al. Prevention of tea-induced extrinsic tooth stain. IntJ Dent Hyg. 2014; 12(4):267-72.
3. Watts A& Addy M Tooth discolouration and staining: A review of the literature. *Brit Dent J*; 2001;190(6) 309-316.
4. Sulieman M, Addy A, Rees JS. Development and evaluation of a method in vitro to study the effectiveness of tooth bleaching. *J Dent* 2003; 31:415-22.
5. Polydorou O, Hellwig E, Hahn P. The efficacy of three different in-office bleaching systems and their effect on enamel microhardness. *Oper dent*, 2008; 33(5):579-586.
6. Sulieman M, Addy M et al. The effect of hydrogen peroxide concentration on the outcome of tooth whitening: an in vitro study. *J Dent*, 2004; 32: 295–299.
7. Sulieman M, Addy M, et al. The bleaching depth of a 35% hydrogen peroxide based in-office product: A study *in vitro*. *JDent*, 2005; 33(1):33-40.
8. Luk K, Tam L & Hubert M. Effect of light energy on peroxide tooth bleaching. *J Am Dent Assoc*2004;135(2):194-201.
9. Zekonis R, Matis BA, Cochran MA, Al Shetri SE, Eckert GJ & Carlson TJ Clinical evaluation of in-office and athome bleaching treatments *Oper Dent*2003;28(2): 114-121.
10. Al Shetri SE, Matis BA, Cochran MA, Zekonis R &Stropes M A clinical evaluation of two in-office bleaching products *Oper Dent*2003;28(5):488-495.
11. Rodrigues JA, Marchi GM, Ambrosano GM, Heymann HO & Pimenta LA Microhardness evaluation of *in situ* vital bleaching on human dental enamel using a novel study design *Dent Mater*2005;21(11):1059-1067.
12. Featherstone JD, ten Cate JM, Shariati M & Arends J Comparison of artificial caries-like lesions by quantitative microradiography and microhardness profiles *Caries Res*1983;17(5):385-391.
13. Pugh G Jr, Zaidel L, Lin N, Stranick M & Bagley D High levels of hydrogen peroxide in overnight tooth-whitening formulas: Effects on enamel and pulp *J Esthet Restor Dent*2005;17(1): 40-45.
14. Duschner H, Gotz H, White DJ, Kozak KM &Zoladz JR .Effects of hydrogen peroxide bleaching strips on tooth surface color, surface microhardness, surface and subsurface ultrastructure, and microchemical (Raman spectroscopic) composition *The Journal of Clinical Dentistry* 2006;17(3) :72-78.
15. de Oliveira R, Basting RT, Rodrigues JA, Rodrigues AL Jr& Serra MC. Effects of a carbamide peroxide agent and desensitizing dentifrices on enamel microhardness *American Journal of Dentistry* 2003;16(1):42-46.
16. Justino LM, Tames DR & Demarco FF .*In situ* and *invitro* effects of bleaching with carbamide peroxide on human enamel *Oper Dent*2004;29(2): 219-225.

Corresponding Author

Dr. Ashish Kushwah
 Post Graduate Student
 Department of Orthodontics
 Teerthankar Mahaveer Dental College & Research Centre, Moradabad
 Uttar Pradesh, India
 Email-ashish.kushwah998@gmail.com

How to cite this article: Pathak V K, Mankeliya S, Singh K, Jain K, Sharma A, Kushwah A, The Tooth Whitening Efficacy of Three Different In- Office Bleaching System and Effect on Enamel Microhardnes. "An In- Vitro Study . *TMU J Dent* 2018;5:11-14.