IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 2 Ver. V (February. 2017), PP 74-77
www.iosrjournals.org

Effect of Fluoridated and Non-Fluoridated Bleaching Agents on Enamel Microhardness: An in Vitro Study

Dr. Manoj Chandak, Dr. Nikita Oswal, Dr. Manali Saoji, Dr. Nikhil Mankar, Dr. Shrenik Oswal, Dr. Rakhi Chandak
Sharad PawarDental College, Sawangi (Meghe), Wardha, Nagpur

Abstract: *The aim of this study was to investigate the effect of fluoridated and non-fluoridated carbamide peroxide gel on enamel microhardness (Vickers hardness number).60 extracted human premolar teeth were selected. Teeth were divided into 3 groups. Group A- Control (no bleaching), Group B- (non-fluoridated bleaching agent) group C (fluoridated bleaching agent). All specimen were bleached for 21 days with the respective bleaching agents for 4 hours. Microhardness testing was done on baseline (prior to bleaching) and on 21st day (post bleaching).Statistical analysis was done by paired t test, and (0.01) is considered as level of significance. After bleaching all samples group B showed decrease in micro-hardness, while microhardness was increased in group C. Enamel microhardness is reduced after bleaching with 16% CP gel, but fluoridated bleaching agent increased the enamel microhardness.*

I. Introduction

Because of the growing need for beautiful, white teeth, the establishment of esthetic treatment methods has become increasingly important in recent years. In middle of the 19th century, the first attempts were made to lighten discoloured teeth using various agents. Initially, oxalic acid was used, until the bleaching effect of hydrogen peroxide was discovered in 1884.Bleaching is an age old treatment, whose time has finally come. The technique has been performed for over a century. It is one of the most documented clinical techniques in dentistry and yet it has escaped the acceptance that it deserves (1). The reasons could be the possible adverse effects occurring due to bleaching such as reduction in micro-hardness (2).

Different authors, over the years, tried various methods and techniques to aid in bleaching. And one such technique is the At Home Bleaching technique, where the procedures are done by the patient at home. Hence the practioner has little or no control over the procedure. Different concentrations of carbamide peroxide gel or hydrogen peroxide are used in dentistry, though it may result in structural changes on tooth surface. However the effect of carbamide peroxide containing bleaching agents on enamel micro-hardness is controversial (3). According to Attin and others, enamel microhardness reduced after application of bleaching agent. (4)Fluorides are been used extensively for remineralisation of enamel in form of varnishes, or added in toothpastes (5). Also, when fluoride applied post bleaching showed prevention in loss of enamel hardness (6). It is said that a layer of calcium fluoride is formed that causes this action.Therefore this study was taken up with an aim to evaluate the effect of fluoridated and non-fluoridated bleaching agents on enamel microhardness

II. Materials And Methods

60 human premolar teeth extracted for periodontal or orthodontic reasons were selected. Teeth that were carious, restored and with any cracks or fracture were excluded from the study.

Sample preparation: sectioning of the selected teeth was done 2 mm below CEJ horizontally, to divide the tooth in crown and root.The crowns were used while the roots were discarded. These crowns were then sectioned vertically, to divide them bucco-lingually using double sided diamond disc (fine grit). These sections were polished using 4000 grit carborundum paper discs. The prepared sections were stored in artificial saliva for 7 days 37°C in humid conditions. Subsequently the samples were embedded in cold cure acrylic resin blocks before bleaching, with the enamel surface showing. The blocks were prepared withmoulds of 2x2x2 cm. Moulds were filled with resin and the sections were positioned in them before complete setting of material. Sections were positioned such that the enamel surface be elevated 1mm above the surface of resin. Micro-hardness testing of each sample was done before bleaching using microhardness tester (Vicker's Micro-hardness tester, DHV- 3000, Croma, Pune, India). VHN values were measured (kg/mm^2) at a load of 100 gm for 5 secs. Three indentations were made in the central part of the exposed enamel for each sample. For each indentation, the long axis of the diamond indenter was perpendicular to the enamel surface. Each measurement was done at least 500 μm from the edge of the enamel, spaced 100 μm apart.

BLEACHING
The samples were randomly divided in 3 groups
Group A: No bleaching done
Group B: Bleaching done with non-fluoridated carbamide peroxide gel 16%
Group C: Bleaching done with fluoridated carbamide peroxide gel 16%

Initiation of bleaching process was done subsequent to measurement of the initial micro-hardness. Specimens were dried with cotton pellets. 1 mm layer of the bleaching gel was applied on the exposed surfaces of the specimens using applicator tips. Bleaching for each sample was done for four hours every day for 21 consecutive days in humid atmosphere at37°C. After each session of bleaching, the gel was removed using cotton pellet and the specimens were washed and dried. Then specimens were stored in artificial saliva at 37°C. Fluoridated gel was used for samples in group C, while non-fluoridated gel for group B.
Microhardness was measured again after bleaching.

Statistical analysis
Statistical analysis of mean of microhardness of specimens before and after bleaching was done by paired 't' test. $p<0.01$; Highly Significant.

III. Results

The mean of microhardness of group B before bleaching was 313.42 (SD 30.91) and the microhardness decreased after bleaching to mean of 299.89 (SD 25.63). While the mean of microhardness for group C before bleaching was 300.91(SD 25.41) and increased to 312.43 (SD 22.34) after bleaching.

Table 1: Comparison of mean microhardness of non-fluoride group before and after bleaching

	N	Mean	Std. Deviation	t	p-value
Before	20	313.42	30.91	6.16	0.000*
After	20	299.89	25.63		

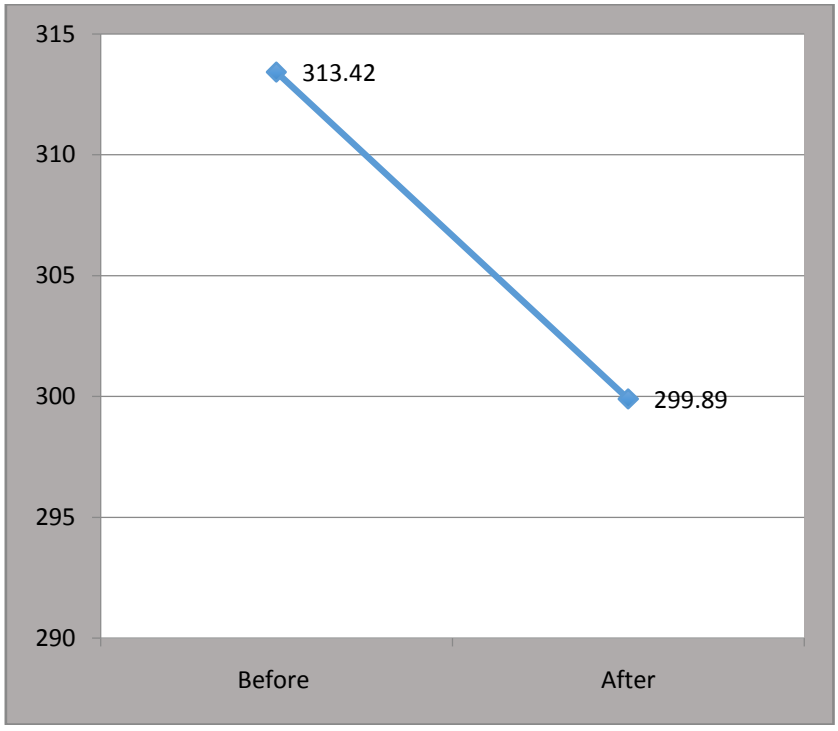
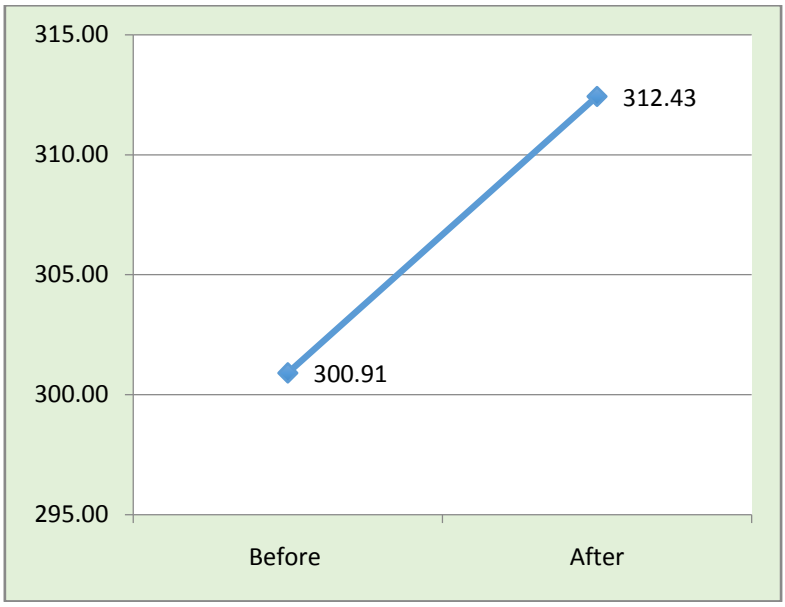


Table 2: Comparison of mean microhardness of fluoride group before and after after bleaching.

	N	Mean	Std. Deviation	t	p-*value*
Before	20	300.91	25.41	-4.91	0.001*
After	20	312.43	22.34		



IV. Discussion

Microhardness is a broadly used term referring to the testing of hardness involving materials by using small applied loads. A more appropriate term to describe this is microindentation hardness testing. In this method, the use of a diamond indenter with a particular shape is used to make an impression called a "test load" or "applied force". Vickers hardness technique uses a square pyramid indentor for measurement.The load is divided by the area of indentation.

In the present study microhardness of enamel decreased on application of non-fluoridated bleaching agent. The mechanical properties of enamel mostly depends on the degree of mineralization (7). Cuy et al in their study theorized that there is a strong relation between mechanical properties of enamel and the degree of mineralization (8). On Bleaching enamel, there is loss of organic & inorganic compounds which leads to change in ratio of the compounds and further producing weak enamel along with erosive areas and increased porosity ultimately affecting the mechanical properties of enamel by reduction in micro-hardness (9).But the effect of bleaching on microhardness of enamel is controversial. Park and others found no change in microhardness after bleaching (10)In a study by Shannon et al, there was decrease in microhardness when enamel slabs were subjected to 10% CP gel (11). Also Asefzadeh and Hosseni reported similar results after bleaching with 10% CP gel for 56 hours (12). Different factors that affect the change in microhardness include the concentration, time of application, pH of gel, method of activation etc. the discrepancy in the results of various studies might be due to differences in the study design.

After application of fluoridated bleaching agent the micro-hardness was increased in the present study. Fluoride reacts with hydroxyapatite (HAP) crystals in enamel. Reaction with HAP directly or promote the transformation of other calcium phosphate phases forming Fluorapatite (FA) and fluoridated hydroxyapatite (FHA). The formation of FA or FHA can reduce the solubility of Hydroxyapetite crystals and lead to remineralization (6).Attin T et al reported reduction in demineralization of enamel on application of fluoridated bleaching agent (13). Chen et al presented with similar results (14) which are in accordance with the present study. Also the caries resistance increased in the teeth that were treated with fluoridated bleaching agents (15).

V. Conclusion

Within the limitation of this study, it is concluded that microhardness of enamel decreased on application of non-fluoridated bleaching agent. While application of fluoridated bleaching agent increased the microhardness of enamel.

References

[1]. Haywood VB, Heymann HO. Nightgaurd vital bleaching. Quintessence Int. 1989;20:173-6
[2]. Basting RT, Rodrigues Junior Al & Serra MC (2001). The effect of 10% carbamide peroxide bleaching material on microhardness of sound and demineralized enamel and dentine, in situ. Operative dentistry 26(6) 531-539
[3]. Oltu U, Gurgan S (2000). Effects of three concentrations of carbamide peroxide on structur of enamel. Journal of oral rehabilitation 27:332-340
[4]. Attin T, Vollmer D,Weigand A, Attin Rand Betke F (2005) subsurface microhardness of enamel and dentin after different external bleaching procedures. American Journal of dentistry 18(1) 8-12.

[5]. White DJ, Featherstone JD. A longitudinal microhardness analysis of fluoride dentifrice effects on lesion progression: in vitro. Caries Res. 1987; 21:502-12
[6]. Attin T, Keilbassa AM, Schwanenberg M, Hellwig E. Effect of fluoride treatment on remineralization of bleached enamel. J oral Rehabilitation 1997;24;282-6
[7]. Kodaka T, Debari K, Yamada M, Kuroiwa M. correlation between microhardness and mineral content in sound human enamel. Caries Res. 1992;26:139-41
[8]. Cuy JL, Mann AB, Livi KJ, Teaford MF, Weihs TP. Nanoindentation mapping of Mechanical properties of human molar tooth enamel. Arch Oral Biol. 2002;47:281-91
[9]. Goldstein GR, Kiremidjian-Schumacher L. Bleaching: Is it safe and effective? J Prosthet Dent. 1993;69:3258
[10]. Park HJ, Kwon TY, Nam SH, Kim HJ, Kim KH and Kim YJ (2004) Changes in bovine enamel after treatment with a 30% hydrogen peroxide bleaching agent Dental Materials Journal 23(4) 517-521.
[11]. Shannon H, Spencer P, Gross K, Tira D. Characterization of enamel exposed to 10% carbamide peroxide bleaching agents. Quintessence Int. 1993;24:39-44.
[12]. Asefzadeh F, Hosseni F. A comparative study of effects of Kimiya bleaching gel (an Iranian brand) and Opalescence on human enamel microhardness. Daneshvar, Scientific-research Journal of Shahed University. 2006;13:7-1.
[13]. Attin T, Kocabiyik M, Buchalla W, Hanning C and Becker K (2003) Susceptibility of enamel surfaces to demineralization after application of fluoridated carbamide peroxide Gels. Caries research 37(2) 93-99.
[14]. Chen HP, Chang CH, Liu JK, Chuang SF and Yang JY (2008) Effect of fluoride containing bleaching agents on enamel surface properties Journal of Dentistry 36(9) 718-725.
[15]. Al-Qunain TA. The effect of whitening agents on caries susceptibility of human enamel. Operative Dent. 2005;30:265-70