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Original Article

Evaluation of Effects of Different Bleaching Agents on Bovine Surface Enamel

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ABSTRACT:

Background: Among various bleaching techniques for intrinsic tooth discoloration, vital and nonvital bleaching techniques are common one. The present study was conducted to evaluate the effects of bleaching agents with and withoutfluoride as well as the post-bleaching fluoridation on bovinesurface enamel. **Materials & Methods:** This study was conducted in department of Endodontics.It included 60 extracted bovine incisors which were cut into halves, embedded andthen divided into the following three groups. Group I: It consisted of 20 control specimens soaked in Hank buffer salinesolution (HBSS) at 37 degree C for 2 weeks. Group II: It consisted of 20 specimens treated with 10% opalescence fluoride-free bleachingagent. Group III: It consisted of 20 specimens treated with 10% opalescence fluoride-free bleachingagent with additional 2% neutral sodium fluoridegel for 3 min. All specimens were evaluated for color change and micro hardness on day 7 and day 14. **Results:** The lightness change in DL was more significant thanin Da and Db on Day 7. In group I, there was no color change. Group II, III showed DL and overall color change DE and increased by 3, 4 units, respectively. Group II, III showed comparable DL and DE values and greater than group I ($P < 0.01$) on Day 14.Group I showed minimal whitening effect and values were < 3 units. The color changewas increased in DL and decreased in Db but unchanged inDa in groups II, III. The DE in all groups exceeded by7. There were significant changes in the DL, Da, Db values in four bleaching groups from Days 7 to14. **Conclusion:** In all groups, whitening efficiency was similar with increase in whiteness and decrease in yellow color saturation. Fluoridated bleaching gel improves whitening efficiency and results in lessdemineralization changes such as the erosion morphologyand hardness loss.

Key words: Fluoridated bleaching gel, micro hardness, surface morphology

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INTRODUCTION

Among various bleaching techniques for intrinsic tooth discoloration, vital and non-vital bleaching techniques are common one. They use oxidizing agents such as hydrogen peroxide to remove intrinsic stains. They are widely used agents as they have safe to use. These properties have made them popular.Further modifications in these agents have opened multiple options for dentists in managing tooth discoloration.[1]

In the modern era, aesthetic dentistry is becoming famous. The demand of tooth bleaching is increasing day by day and it has become the treatment of choice for tooth discoloration. If there is deposition of chromatogenic material into dentin and enamel during the tooth development stage or after eruption, it leads to intrinsic tooth discoloration.[2]

Carbamide peroxide (CP) is a perhydrol-urea and hydrogen peroxide carbamide compoundwhich degrades to urea and hydrogen peroxide. This agent with ‘‘night guard’’ bleaching technique, have proved effective and efficient in providing good results.However,altered surface morphology, decreased microhardness andloss of dental hard tissue volume are among few side effects of bleaching as shown by various authors. 10% CP has been proved to decrease the enamel microhardness as compared to higher level.[3]However, a study performed by Potocniket al.[4]found that 10% CP causes local microstructural changes and there is no affect on enamel microhardness. 10% CP is a safest bleaching agent as demineralization is not clinical evident, moreover, it is soon followed by remineralization.

Fluoridated bleaching agents are considered to reduce theadverse effects of tooth whitening. Topical fluoride is used to increase thehardness and acid resistance of

demineralized teeth. It may be used in toothsensitivity peripherally by occluding the dentinal tubules andreducing dentinal fluid flow.Hence, fluoride application may be used for treating post-bleachingsensitivity.[5]The present study was conducted to assess the effects of bleaching agents with and withoutfluoride as well as the post-bleaching fluoridation on bovinesurface enamel.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It included 60non-carious anterior teeth specimens. Thespecimens were stored in buffered saline. These teeth were cut into halves and were embedded in epoxy resin withthe labial surface parallel to the horizontal plane. Thespecimens were then smoothed with 600- and 1000-gritsilicone carbide abrasive paper and polished with a series of30, 9, 6 and 1 mm diamond suspension. Thespecimens were then divided into 3treatment groups:

Group I: It consisted of 20 control specimens soaked in Hank buffer salinesolution (HBSS) at 37 degree C for 2 weeks. Group II had 20specimens treated with 10% opalescence fluoride-free bleachingagent. Group III had 20 specimens treated with 10% opalescence fluoride-free bleachingagent with additional 2% neutral sodium fluoridegel for 3 min.

The specimens of group II, III were bleached 8 h/day X 14 days. The bleaching agents were applied on theenamel and stored at 100% humidity at 37 degree C. Rinsing with tap water was done after application of bleaching agent to each specimen for 1 minute and was stored in HBSS at 37 degree C. The color change, microhardness and surface topography were evaluated after 14 days. The color of each specimen was measured as baseline data onDay 0. The color of each specimen was assessed by the CIE–Labsystem in L a b mode using a dental colorimeter. The assessed area was the cervical area, 1 mmocclusal to the cemento-enamel junction. After the bleachingtreatment, the specimens were again inspected on Days 7and 14 to measure the color changes. ‘‘L’’ represents the degree of grayand corresponds to a value of brightness. The ‘‘a’’ is aparameter in the red-green spectrum and ‘‘b’’ is aparameter in the blue-yellow spectrum.

RESULTS

Table I shows color change values differencesin L, a and b between Days 7, 14 and baseline. The lightness change in DL was more significant thanin Da and Db on Day 7. In group I, there was no color change. Group II, III showed DL and overall color change DE and increased by 3, 4 units, respectively. Group II, III showed comparable DL and DE values and greater than group I ($P < 0.01$) on Day 14.Group I showed minimal whitening effect and values were < 3 units. The color changewas increased in DL and decreased in Db but unchanged inDa in groups II, III and. The DE in all groups exceeded by7. There were significant changes in the DL, Da, Db values in 2 bleaching groups from Days 7 to14.The enamel surface wasunchanged on the unbleached specimen in Group I. Group II and III showed significant alterationwith erosion appearance.

DISCUSSION

Fluoride helps in remineralizing dental erosion by forming acalcium fluoride layer and increasing resistance to acid attacks thus inhibiting demineralization. Chemical and physical properties of bovine teeth such as composition, hardness and tensile strength are close to human teeth.For the evaluation of bleaching methods, young bovine teeth are considered despite of higher lightnesswith the shade of bovine enamel than in human enamel.[5]

The present study was conducted to assess the effects of bleaching agents with and withoutfluoride as well as the post-bleaching fluoridation on bovinesurface enamel.A recent study conducted by Attinet al.[6]assessed the remineralizing property of various fluoride applications following bleachingtreatment. Fluoride application preserves hardness after bleaching.De Oliveira et al.[7]in their study commented thatfluoride dentifrice along withbleaching treatment retains the enamel microhardness at baseline values.

In present study we included 60 non carious anterior teeth specimen which were divided into 3 groups of 20 teeth each. In each group, bleaching treatment was performed. First of all, we evaluated the color change values in each group at day 7, 14, 21and 28. In group I, there was no color change whereas group II, III showed color change increased by 3, 4units, respectively.

Table I Mean of value of color difference in groups recorded at day 7 and 14

	Day 7				Day 14			
Groups	**L**	**a**	**b**	**E**	**L**	**a**	**b**	**E**
Group I	1.6±0.72	0.12±0.3	0.32±0.38	2.12±1.3	2.6±0.52	0.42±0.3	0.12±1.18	2.62±1.3
Group II	4.2±3.2	0.14±0.3	-0.14±0.2	5.12±2.3	7.2±2.25	0.01±0.3	-0.34±0.8	7.8±2.6
Group III	3.02±3.4	-0.32±0.31	-0.15±0.2	5.02±2.4	5.02±3.4	-0.5±2.31	-3.15±2.2	7.12±1.4

There were significant changes in the DL, Da, Db values in four bleaching groups from Days 7 to14. This is in agreement with Betkeet al.[8]

In our study, we compared surface morphology in all groups. Group I showed unchangedenamel surface on the unbleached specimen. Group II and III showed significant alterationwith erosion appearance.This is in agreement with Sharma et al.[9]

Adverseinteractions between CP and fluoride may be resulted by adding fluoride in bleaching agent whereas calcium fluoride layer may hampers the whitening efficiencyof CP. Burgmaier et al.[10]in their study revealed that bovine teeth treated with CPfollowed by high-dosed fluoridation increased the fluorideuptake even though the structurally bound fluoride was lowerthan that in teeth receiving fluoridation only.The whitening efficiencyof CP may be impaired by the calcium fluoride layer while the remineralization potential of fluoride may behampered by CP. However, the limited available data regardingthe potential problems supports the continued use offluoridated bleaching gels.[11]

CONCLUSION

In all groups, whitening efficiency was similar with increase in whiteness and decrease in yellow color saturation. Fluoridated bleaching gel improves whitening efficiency and results in lessdemineralization changes such as the erosion morphologyand hardness loss.

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