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Original Research

An *in vitro* study of comparison of different bleaching agents in temporary and permanent teeth

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***ABSTRACT*:**
Background: The tooth discolorations are classified as extrinsic and intrinsic. The present study was conducted to compare efficacy of hydrogen peroxide (HP), sodium perborate (SP) and carbamide peroxide (CP) as bleaching agents for permanent and primary teeth. **Materials & Methods:** This study was conducted on 90 freshly extracted teeth (45 permanent and 45 primary teeth) with intact crowns. Teeth were subdivided into 3 groups, according to the bleaching material used in the pulp chamber in both permanent and primary teeth (subgroup A: 10% CP gel; subgroup B: 9.5% HP gel; subgroup C: 10% SP paste). **Results:** The mean color value at day 0 in sub group I A was 9.4, in group IB was 10.2 and in group III A was 11.4, in sub group II A was 10.8, group II B was 10.6 and group III B was 11.2. The difference was non- significant (P> 0.05). The mean color value at day 7 in sub group I A was 3.8, in group IB was 6.7 and in group III A was 9.4, in sub group II A was 8.2, group II B was 8.6 and group III B was 8.8. The difference was significant (P< 0.05). The mean color value at day 14 in sub group I A was 2.8, in group IB was 6.4 and in group III A was 8.4, in sub group II A was 7.2, group II B was 7.6 and group III B was 8.2. The difference was significant (P< 0.05). **Conclusion:** Authors found that CP, HP, and SP were equally effective in management of discolored primary teeth whereas in discolored permanent teeth CP was effective.
Key words: Bleaching agent, Primary teeth, Permanent teeth

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INTRODUCTION

The etiology of tooth discolorations is multi-causal and can result from individual behavior, diseases, injury and other exposures along with various physiological processes.[1] Professional cleaning of discolored teeth is a common procedure to remove the majority of extrinsic strains. Various bleaching techniques and products are used to remove intrinsic stains: In-office or power bleaching, home bleaching, and over-the-counter bleaching products.[2]

The tooth discolorations are classified as extrinsic and intrinsic, where the extrinsic stains can be removed with the routine prophylactic measures in the dental office.[3] The intrinsic discolorations in the tooth might result from penetration of discoloring agents in the dentinal tubules, systemic medications, excess water fluoridation, or due to by-products of the body such as bilirubin released into the dentinal tubules during illness. The intrinsic stains can be treated by various measures such as internal bleaching of nonvital teeth,

external bleaching of vital teeth, microabrasion of enamel and prosthetic rehabilitation by crowns and veneers.[4]

The intracoronal bleaching is an established, simple, cost-effective, and conservative method for improving the color of discoloured teeth in permanent and primary teeth.[5] The advantage like minimal patient compliance makes the intracoronal bleaching technique more applicable in the children and young adolescents. The hydrogen peroxide (HP) (30% and 35%), sodium perborate (SP), carbamide peroxide (CP) (10%, 20%, 35%) are the most commonly used bleaching agents for permanent and primary teeth.[6] The present study was conducted to compare efficacy of hydrogen peroxide (HP), sodium perborate (SP) and carbamide peroxide (CP) as bleaching agents for permanent and primary teeth.

MATERIALS & METHODS

This study comprised of 90 freshly extracted teeth (45 permanent and 45 primary teeth) with intact crowns. Ethical clearance from ethical committee was taken prior to the study. They were informed regarding the study and written consent was obtained.

After staining the extracted teeth with centrifugation method, the stained teeth were assessed for their color change as compared to the prestained state by means of Vita 3D Master Shade guide. The color change was recorded, and the stained teeth were photographed. After standard access cavity preparation, the root canals were cleaned and shaped using 5% sodium hypochlorite and normal saline for irrigation. Biomechanical preparation was done with K files, and the canals were subsequently enlarged using step-back technique in permanent teeth and selective filing technique in deciduous teeth. This was followed by obturation with zinc oxide eugenol in primary teeth and gutta-percha with root canal sealer using lateral condensation in permanent teeth.

Teeth were subdivided into 3 groups, according to the bleaching material used in the pulp chamber in both permanent and primary teeth (subgroup A: 10% CP gel; subgroup B: 9.5% HP gel; subgroup C: 10% SP paste). Around 0.04 mL of bleaching agent was syringed into the access cavity of the tooth and then sealed with temporary sealing material. After 7 days, color of bleached teeth was determined. The teeth were then again evaluated for their shade change after another 7 days. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I (45)	Group II (45)
Teeth	Permanent	Temporary
Subgroup	(Group IA) CP =15	(Group II A) CP =15
	(Group IB) HP= 15	(Group II B) HP =15
	(Group IC) SP= 15	(Group II C) SP=15

Table I shows that group I had permanent and group II had temporary teeth which were subdivided into based on bleaching agents used. Each sub group had 15 teeth.

Table II Mean values of the color at 0 day

Sub group	Group I	Group II	P value
CP	9.4	10.8	0.04
HP	10.2	10.6	0.91
SP	11.4	11.2	0.94

Table II, graph I shows that mean color value at day 0 in sub group I A was 9.4, in group IB was 10.2 and in group III A was 11.4, in sub group II A was 10.8, group II B was 10.6 and group III B was 11.2. The difference was non-significant (P> 0.05).

Graph I Mean values of the color at 0 day

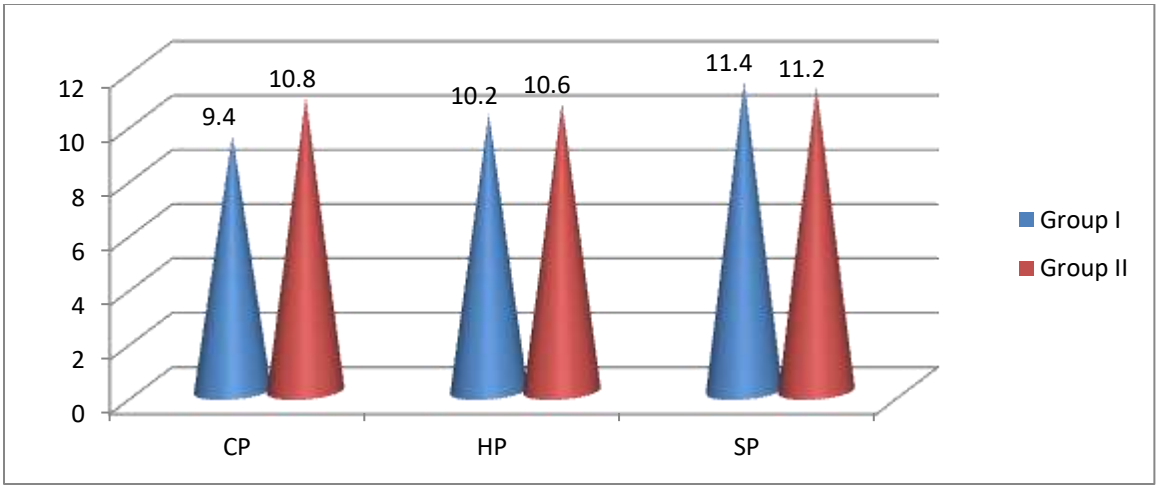


Table III Mean values of the color change at 7 day

Sub group	Group I	Group II	P value
CP	3.8	8.2	0.001
HP	6.7	8.6	0.05
SP	9.4	8.8	0.12

Table III, graph II shows that mean color value at day 7 in sub group I A was 3.8, in group IB was 6.7 and in group III A was 9.4, in sub group II A was 8.2, group II B was 8.6 and group III B was 8.8. The difference was significant (P< 0.05).

Graph II Mean values of the color change at 7 day

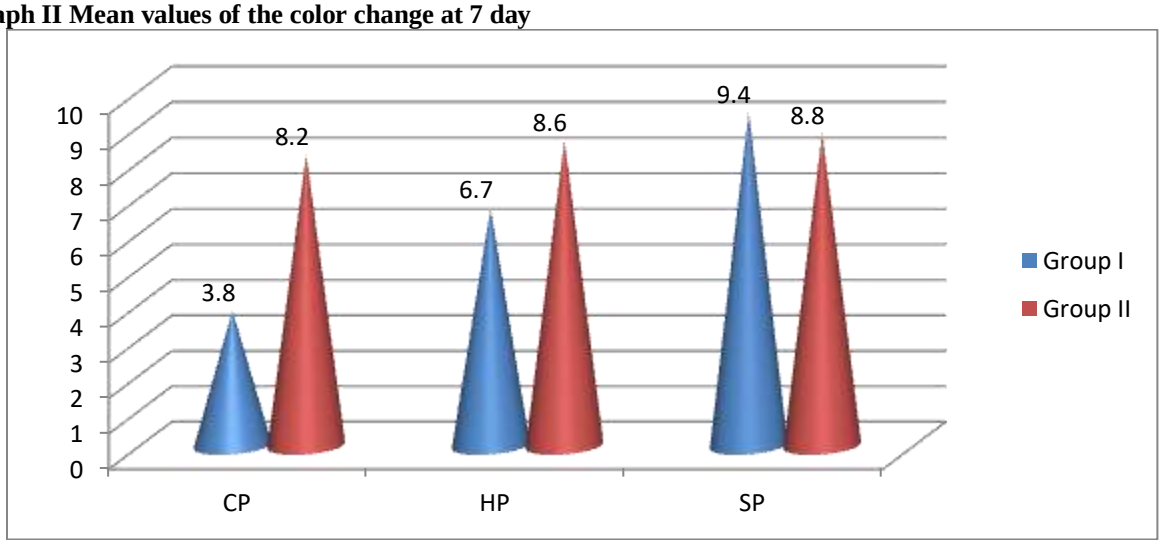
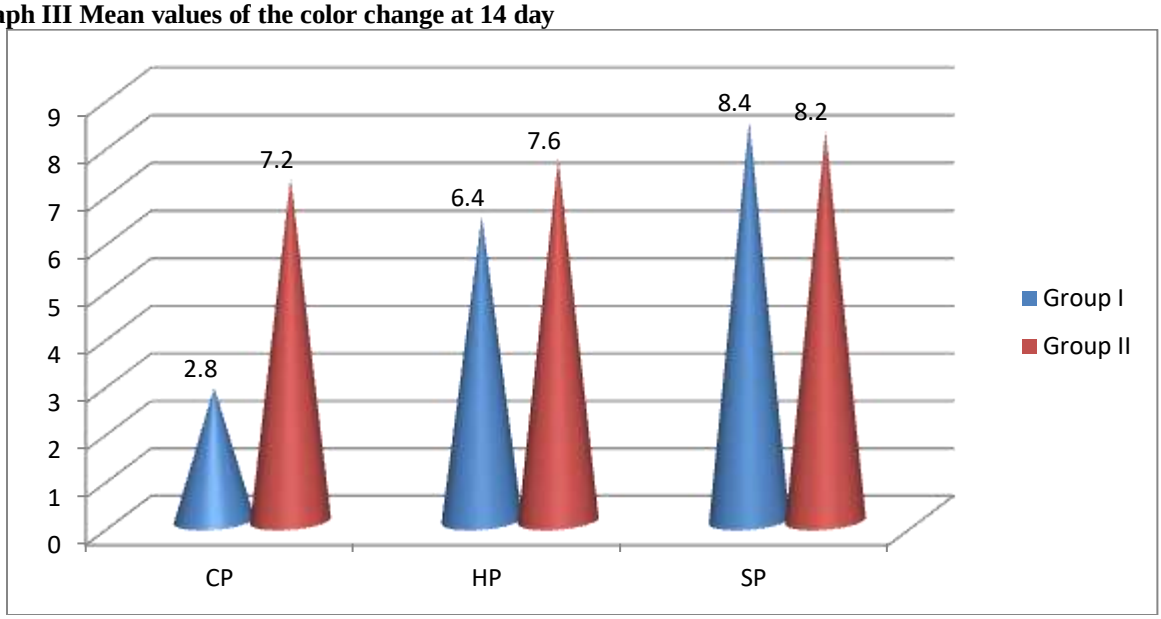


Table IV Mean values of the color change at 14 day

Sub group	Group I	Group II	P value
CP	2.8	7.2	0.001
HP	6.4	7.6	0.02
SP	8.4	8.2	0.14

Table IV, graph III shows that mean color value at day 14 in sub group I A was 2.8, in group IB was 6.4 and in group III A was 8.4, in sub group II A was 7.2, group II B was 7.6 and group III B was 8.2. The difference was significant (P< 0.05).

Graph III Mean values of the color change at 14 day



DISCUSSION

Most bleaching products use hydrogen peroxide as active agent. However, bleaching treatments with peroxide may cause local adverse effects such as oral mucosa irritation, pulpal sensitivity, pulpitis or alteration of the enamel surface.[7] On the other hand, bleaching is a relatively safe procedure that predominantly causes severe adverse effects only at high hydrogen peroxide concentrations on hard tissue, soft tissue and restorative materials.[8] The European Scientific Committee on Consumer Products (SCCP) reported that the use of tooth whitening products containing >0.1 to 6.0% hydrogen peroxide or equivalent hydrogen peroxide-releasing substances is safe after consultation with a dentist.[9] The present study was conducted to compare efficacy of hydrogen peroxide, sodium perborate and carbamide peroxide as bleaching agents for permanent and primary teeth.

In this study, teeth were subdivided into 3 groups, according to the bleaching material used in the pulp chamber in both permanent and primary teeth (subgroup A: 10% CP gel; subgroup B: 9.5% HP gel; subgroup C: 10% SP paste). We found that mean color value at day 0 in sub group I A was 9.4, in group IB was 10.2 and in group III A was 11.4, in sub group II A was 10.8, group II B was 10.6 and group III B was 11.2. Behl et al[10] in their study divided test samples into group I (permanent teeth) and group II (primary teeth). The test samples were further divided into three subgroups according to the experimental materials used for bleaching [group IA—10% carbamide peroxide (CP), group IIB—9.5% hydrogen peroxide (HP), and group IIIC—10% sodium perborate (SP)]. The samples were evaluated at 7 days and 14 days after the completion of intracoronal bleaching procedure. The CP group showed lowest shade values, and SP group showed the highest shade values after 14 days in both permanent and primary teeth. The CP showed the significant difference in the shade at 7 days and 14 days in permanent teeth. No statistically significant difference was observed between the three experimental at the 7 days and 14 days in the primary teeth.

We found that mean color value at day 7 in sub group I A was 3.8, in group IB was 6.7 and in group III A was 9.4, in sub group II A was 8.2, group II B was 8.6 and group III B was 8.8. Bizhand et al[11] in their study 40 subjects participated which were randomly allocated to two groups (n=20). The test group received the OTC product (iWhite Instant) and the placebo group received an identically composed product except for the active agents. Each subject was treated with a prefilled tray containing iWhite Instant or the placebo for 20 minutes. There were no significant differences at E_0 between placebo and test groups regarding the tooth color. Differences in tooth color changes immediately after (ΔE1_0) and 24 h after treatment (ΔE2_0) were calculated for both groups. The mean values (standard deviations) of tooth color changes for ΔE1_0 were 2.26 (0.92) in the test group and 0.01 (0.21) in the placebo group. The color changes for ΔE2_0 showed mean values of 2.15 (1.10) in the test group and 0.07 (0.35) in the placebo group. For ΔE1_0 and ΔE2_0 significant differences were found between the groups.

We observed that mean color value at day 14 in sub group I A was 2.8, in group IB was 6.4 and in group III A was 8.4, in sub group II A was 7.2, group II B was 7.6 and group III B was 8.2. Carrasco et al[12] reported that the 37% CP as an intracoronal bleaching increased dentinal permeability, which was not observed for 27% CP. Thus, the use of CP at lower concentrations should

be recommended to reduce the frequency of cervical root resorptions.19 The degradation of 10% CP releases 6.4–7% of urea and 3–3.6% of HP where as the 35% CP releases 23–25% of urea and 10–12% of HP.
The shortcoming of study only 3 bleaching agents were compared.

CONCLUSION

Authors found that CP, HP, and SP were equally effective in management of discolored primary teeth whereas in discolored permanent teeth CP was effective.

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