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Bleaching of Vital Teeth: A Study on Efficacy, Shade, Retention, Side Effects And Patients Perceptions

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SUMMARY

Sixty patients received a prophylaxis (cleaning and polishing) before beginning of treatment. Each patient was evaluated for initial shade by Vita shade guide. Safety issues evaluated were the changes in gingival index (GI), plaque index (PI), (Loe-Silness Scale) Non-marginal gingival index (NMGI), non-gingival oral mucosal index (NGOMI) (Curtis and colleague). The patient's perceptions about bleaching technique after treatment were evaluated. Tooth sensitivity (TS) during treatment and post treatment was evaluated. 10% Carbamide peroxide (opalescence tooth whitening gel, ultradent products inc.) was used for bleaching teeth in a custom made maxillary tray for the placement of bleaching gel. After initial evaluation and prophylaxis,the subjects were instructed to wear the tray with bleaching gel over-night. The treatment was continued for at least four weeks. After treatment the patient were seen after 6, 12, 18, and 24 week. There were mean scores with standard deviation of shades of teeth of 60 patients at base line. 80% of the patients had no change in the color after 6 months evaluation. 68.3% patients were glad with a treatment. There were mean value with standard deviation of PI, GI, NMG and NGOM was $p>0.05$ i.e. statistically not significant. On the basis of study night guard vital bleaching procedure is regarded as safe and effective.

Key Words: Carbamide-peroxide (CP), night guard vital bleaching, esthetics dentistry.

INTRODUCTION

Several treatment methods are available to improve the esthetics appearance of the dentition. These include laminates, porcelain veneers, full coverage crowns, micro abrasion and chemical stain removal by bleaching[1,2]. The determination of which clinical procedure is best used to optimize tooth color depends on nature, intensity of color, the age of patient, the condition, shape of dentition and the desire esthetic effect[3].

Tooth discoloration is the visible product of physiological processes, diseases, injuries and other exposures[5]. Superficial discoloration due to accumulation of extrinsic stain is noninvasive and can be treated by combination of patient motivation, professional intervention and home care. In contrast discoloration attributed to aging, disease, injury and drug induced such as tetracycline staining is complex in nature and requires comprehensive esthetics or restorative care[6].

Bleaching systems are the most effective treatment option in producing improvements in tooth appearance by removing stains[4]. Bleaching offers a conservative, simplify and economical approach to change the color of teeth[7]. Bleaching is a noninvasive approach to remove the stain[8]. Many changes have occurred in the process of bleaching during the last thirty years from powder bleaching with a heat lamp to laser bleaching today[9].

Two common methods for vital teeth whitening is an in-office procedure called powder bleaching, which uses a 30% to 35% hydrogen peroxide solution in conjunction with heat and light to increase the kinetics of stain remover[10] and fabrication of a mouth guard in which peroxide preparation is placed referred as night guard vital bleaching[11].

Hydrogen peroxide, carbamide peroxide and sodium perborate are generally used for bleaching. Carbamide peroxide with concentration ranging from 3% to 22%[12]. degrades to urea and hydrogen

peroxide (active bleaching agent)[13]. Night- guard overnight vital bleaching with 10% carbamide peroxide gel is the patient applied/dentist supervised bleaching techniques[14].

The advantages of the at home technique include ease of application, reduce chair time and cost, high success rate and safety of material used[15]. The present study was conducted to evaluate the effect of 10% carbamide peroxide as a bleaching agent.

MATERIAL AND METHOD

Study was carried out on 60 patients (recruited from operative department, of Punjab Dental Hospital.) all patients received a prophylaxis (cleaning and polishing) before beginning of treatment. Each patient was evaluated for initial shade by vita-shade-guide. To be considered efficacious, the 10% carbamide peroxide must be capable of producing at least a two shades change on value-oriented scale.

Safety issues evaluated were the changes in gingival index (GI), Plaque index (PI) (Loe-silness scale), non-marginal gingival index (NNMGI) and non-gingival oral mucosal index (NGOMI) (Curtis and colleagues). The patient perceptions about the bleaching techniques after treatment were evaluated. Tooth sensitivity (TS) during treatment and post treatment was evaluated.

10% carbamide peroxide (opalescence tooth whitening gel, (ultra dent products inc.) was used for bleaching teeth. An alginate impression was taken to fabricate a model for custom-made maxillary mouth tray for placement of bleaching gel. All custom trays were trimmed approximately 01mm short off gingiva to avoid impingement on the soft issue. The tray was formed by vacuum performer machine (ultra dent inc) by local dental supply. Shade was recorded by vita-shade-guide.

To asses the gingival condition the Loe-silness GI was employed in the maxillary arch in the anterior quadrant. The required area was isolated with cotton rolls; air-dried and visibly and tactically inspected using a mouth mirror and probe. Four gingival areas (distal, mesial, facial, and palatal) were examined systematically for each tooth. Plaque accumulation was scored by using PI method of Loe-silness. The PI was carried out in a manner similar to that used for the GI. The soft tissue changes occurring in the oral cavity were evaluated by the NMGI and NGOMI. The tray and gel were given to each subject with usage instructions, after initial evaluation and prophylaxis. The tray was checked for fitting before handle it to the patient. The subject was instructed to wear the tray with bleaching over-night. Baseline shade, GI, PI, NMGI, NGOMI and tooth sensitivity were recorded at this appointment. This treatment was continued for four weeks treatment period. After treatment the patients were seen after 6, 12, 18 and 24 weeks and the change in color, GI, PI, NMGI, NGOMI and sensitivity were evaluated.

The data was collected on a Performa. Each participant was evaluated at baseline. The study subjects were seen during treatment to evaluate tooth shade changes, gingival index, plaque index, non-marginal gingival index, non-gingival oral mucosal index, and history of sensitivity and concerns of participants. Patients were recalled after 6,12,18 and 24 weeks. Pre and post photographs were also taken for record.

Main out-Come measure

1. Percentage of shade retention
2. Percentage of soft tissue change
3. Percentage of patients approving the technique.

Statistical analysis

The data was analyzed using SPSS (version 10) program for window.

Safety measures

The non-parametric test, was used to analyze the data. The test allowed for the comparison of the groups at baseline, during treatment, 6,12,18 and 24 weeks post treatment for GI, PI and NMGI. Level of significance was set at $p<0.05$.

Shade change

The average shade values of the teeth were analyzed using a non Parametric test (Wilcoxon Signed Ranks Test) this approach analyses the mean response functions and partition and the variation in shade scores (Ordinal in nature) among the possible

sources of time Baseline, during treatment, 6, 12, 18 and 24 weeks post treatment and time by treatment interaction level of significance was set at $p<0.05$.

RESULTS

The study was conducted in the operative department of Punjab Dental Hospital, Lahore. Total of 60 patients participated in the study with the age range 18 to 40 years (Mean±SD 26.33±73). The male to female ratio was 1:2. Most of the patients were from the Lahore. Only 09 patients were with history of drug taken. Six patients came with the history of tetracycline staining. There were 47 (78.3%) patients having habits of brushing, 5 (8.3%) patients having habits of brushing + Maswaaq, 2 (3.3%) patients having habits of brushing + maswaaq + powder, 5 (8.3%) patients having habits of brushing + powder and 1 (107%) patients having habit of maswaaq. The patients selected in the study were non-smoker and non-pan eater.

Shade of teeth

All shade evaluations recorded, using the vita-shade-guide, were arranged with the guide in value order. The value order was assigned a number from 1 to 16. there were mean scores with standard deviation of shades of teeth of 60 patients at baseline 11.30 ±2.52, at during treatment 7.67±4.08 ($p<0.01$ i.e. statistically significant), at 6 weeks 7.10±4.29 (compare with baseline $p<0.01$ i.e. statistically significant), at 12 weeks 7.0±4.35 (compare with 6 weeks, $p>0.05$ i.e. statistically not significant), at 18 weeks 7.05±4.41 (compare with 12 weeks, $p<0.05$ i.e. statistically not significant) at 24 weeks7.05±4.41 (compare with 18 weeks, $p>0.05$ i.e. statistically not significant).

Safety issues

Mean values with standard deviation over time during a night guard vital bleaching study:

There were mean values with standard deviation of gingival index at baseline 0.19±0.40 ($p>0.05$ i.e. statistically not significant). There were mean values with standard deviation of plaque at baseline 3.59±0.19, ($p>0.05$ i.e. statistically not significant). There were mean values with standard deviation of non-marginal gingival oral mucosal are also same value in all stages.

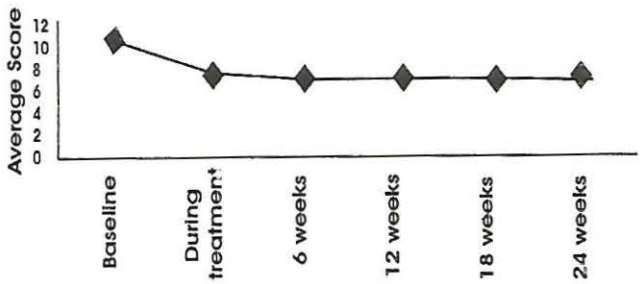

Fig. 1: Shade of teeth.

Sensitivity

During treatment there were 31 patients with mild sensitivity and 21 patients having no sensitivity ($p<0.01$ i.e. statistically significant). After six weeks there were 19 patients with mild, no patient with moderate and 41 patients with no sensitivity (compare with baseline, $p<0.01$ i.e. statistically significant). After 12 weeks there were 9 patients with mild, no patient with moderate and 51 patients with no sensitivity. After 18 weeks there were 4 patients with mild, no patient with moderate and 56 patients with no sensitivity. After 24 weeks there were 3 patients with mild, no patient with moderate and 57 patients with no sensitivity (compare with 6 weeks, $p<0.01$ i.e. statistically significant).

Patients perceptions of shade stability, side effects and night guard vital bleaching technique after 6 months

There were 48 (80.0%) patients have no obvious change in the color, 2 (3.3%) patients had a slight darkening but not noticeable by people, 5 (8.3%) patients had a slight darkening but noticeable by the other people, 2 (3.3%) patients had moderate darkening but not back to original color, 3 (5.0%) patients had significant darkening back to original color. There were 2 (3.3%) patients had any sensitivity with any of the teeth since ending the treatment process that may be treatment related, but 58(96.7%) patients had no any sensitivity with any of the teeth since ending the treatment process. None of the patient had any root canal treatment of the teeth treated.

There was 1 (1.7%) patient who had to have any crown on teeth treated but 59 (98.3%) patients had no crown on teeth treated. There were 41 (68.3%) patients glad after having this treatment

process but 19 (31.7%) patients were not glad after this treatment process. There were 41 (68.3%) patients willing to recommend this treatment procedure to a friend but 19 (31.7%) patients were not willing to recommend this treatment procedure to a friend. There were 41 (68.3%) patients who thought that their teeth were whiter now than before treating them but 19 (31.7%) patient were with the view that their teeth were not whiter than before treating them.

Patients with tetracycline and fluorosis staining

There were 54 (90.0%) patients having no history of tetracycline and only 6 (10.0%) patients have history of tetracycline.

There was history of fluorosis present in 15 (25.0%) patients and history of fluorosis absent in 45 (75.0%) patients.

DISCUSSION

The first objective of the study was to determine efficacy after treatment with 10% CP for a period of four weeks was statistically significant that is $p<0.01$ (7.67±4.08).

Dr. Nathoos reported in study the average change in shade of teeth with color darker than A3 after one week of treatment period was 4.05±1.84 with 10% carbamide peroxide[2].

Matis and colleagues reported a mean of 9.2±6.7 after two weeks NGVB procedure with 10% CP[16].

Dr. Haywood reported that for maximum benefit of NGVB per application and compliance long term treatment the bleaching tray should be worn at night. However a minimum of 2 to 4 hours daily is the second option, because the material is effective for 4 to 10 hours. The average time is 2 to 6 weeks, although it could be changed[18].

In a clinical report described by Haywood et al that out of 38 patients, 35 experienced successful lightening as their teeth discolored by aging, inherent stains, brown fluorosis and tetracycline staining. Non-tetracycline stained teeth showed better result than tetracycline stained teeth. Teeth in yellow range are easier to bleach than dark gray with or without banding[12].

Boddin reported that NGVB procedure is effective for bleaching yellow brown staining of fluorosis, however this procedure tends to make decalcification are hypo calcified white lesion whiter in contrast to tooth and the flluorosis stains are minimally effected by home bleaching. Acid micro abrasion using hydrochloric acid with pumice along with NGVB is the effective way of treating fluorosis[20].

The second objective of this study was to determine the side effects of 10% CP bleaching agent. In our study there was mean value with standard deviation of PI, GI, NGOMI, NGMI $p>0.05$ i.e. statistically not significant. Through out the study there was no one presenting with ulceration or soft tissue irritation that was believed to be treatment related. The sensitivity treatment related with $p<0.01$ statistically significant during treatment after six months post-treatment period there were three patients with mild sensitivity and 57 with no sensitivity ($p<0.01$ compare with six weeks. Dr. Leonard has reported similar results with no side effects[24]

In a study by Matis et al. it has been reported that GI measurements significantly decreased over 3 and 6 months suggesting that bleeding procedure reduce gingivitis

Reports of sensitivity vary from 0.0% to 100% of patients with mild to moderate degree. Schulte and colleagues found that sensitivity was severe enough to cause 40% of patients to discontinue bleaching[16].

Claims have been made that NGVB do not cause sensitivity, however a clinical study shows that sensitivity occurs in 55% to 75 % of treatment groups, the placebo group had 20% to 30% sensitivity and group measuring the tray alone had 15% to 20% sensitivity. Percentage vary by tray design and material, treatment time, and the manner in which question were presented to participants[21].

Leonard et al reported in a study that 16% CP and 10% CP can be effective when used in NGVB with no statistically differences in GI, Pi, NMGI and NGOMI[22].

In our study 68% were happy because the patients with fluorosis and tetracycline stained teeth were not satisfied. 31.7% patients were not glad with this treatment procedure. In the study we evaluated that treatment time should be extended to get better results and the NGVB procedure for the

fluorosis should be combined with micro abrasion. The similar findings had been reported in other studies[18, 20].

The third objective of the study was to evaluate the patients perceptions of whitening technique. In our study 80% of patients had no obvious change in color after six months treatment period. 68% of patients were happy with the treatment and wish to recommend it to their friends[23].

In a longitudinal study (32 in seven year study and 12 in 54 month study) 84% felt their teeth for lighter now than at baseline. 95% were glad that they had gone through the whitening procedure, 93% said that they would go through whitening process again and 98% recommend NGVB to their friends. None of the patient had any side effect after treatment. However during active treatment period the patient had sensitivity and gingival irritations. No one having a crown or restoration on any teeth, nor did any one report having root canal treatment of any treated tooth.

Research on longevity of color change indicated that most of the patients with tetracycline staining had some degree of lightening; even those patients who experienced regression were glad that their teeth were lighter than before. 15 similar finding has been reporting in our study. There is less disagreement concurring the short term lightening effect of dentist supervised home bleaching with 10% CP. However there are some concerns among dental professional regarding the long term effect because of various degree of color relapse reported in several studies[24].

CONCLUSION

It has been concluded that NGVB technique had advantage of ease of application, reduced chair time and cost, high success rate and safety of material used. Patient's compliance with NGVB procedure is generally better than with day time wear. The dentist must monitor the procedure carefully and communicate well with the patient to maximize the benefit, minimize the risks and thereby ensure success.

The result of our study, conducted in Pakistani population, concurs with other clinical studies, using NGVB with 10% CP bleaching solution. It is efficacious and safe with minimal side effects. However it is concluded that for tetracycline stained teeth and fluorosis stained teeth, the active treatment should be prolonged to get better results.

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