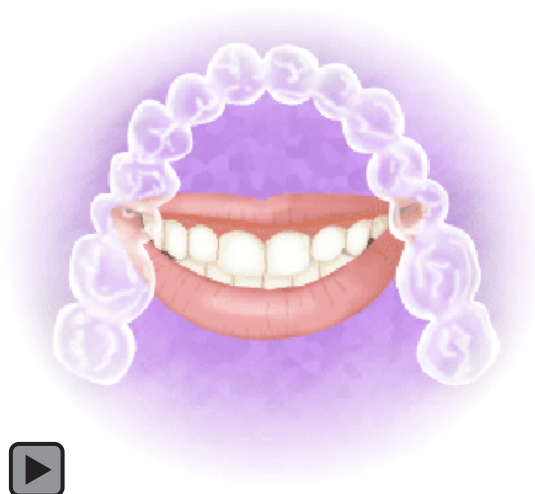


The Effect of a 10% Carbamide Peroxide Home Bleaching System on the Gingival Health

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Abstract

Esthetics plays an important role in dentistry today. Because of an increased emphasis on beauty and health, cosmetic dentistry has been the thrust to the forefront of many practices. Many health products are used for bleaching teeth, but all side effects are not known. Tooth sensitivity and gingival irritation are the most common side effects, but they are typically mild and transient in nature. The aim of this investigation was to evaluate objectively the effect of 10% carbamide peroxide gel (Opalescence™ Utradent Inc, USA) on gingival health by measuring changes in Bleeding Index, Plaque Index, and Gingival Index. Eighteen subjects, 11 female and 7 male, age range 15-30 years (mean 24 years), were selected for the study as a convenient sample. Their teeth had either fluorosis, dental stains, smoking, or tetracycline staining. The Opalescence system was used as office monitored, at-home bleaching for three weeks. There was a statistically significant reduction in bleeding on probing (1% - 37%, $p < 0.003$), Plaque Index (4% - 50%, $p < 0.000$), and Gingival Index (2.5% - 34%, $p < 0.002$). Only two subjects reported tooth hypersensitivity, and none of the subjects complained about gingival irritation. There was a positive change in tooth color as far as staining was concerned. Further research including randomized controlled, double blind clinical trials is needed to confirm these findings and to examine other factors related to bleaching of teeth.

Keywords: Home-care bleaching system, esthetic dentistry, gingival health

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Introduction

Esthetics play an important role in dentistry today. Because of an increased emphasis on beauty and health, cosmetic dentistry has been thrust to the forefront of many practices. Most dental patients desire bright and properly colored teeth, especially in the upper anterior region of the mouth. They seek esthetically pleasing appearances that enhance their self-esteem and confidence.¹

One of the fastest growing areas of cosmetic dentistry is the management of discolored and/or hypoplastic dentition. Whitening offers a conservative, simplified, and economical approach to changing the color of teeth. As a result, tooth whitening has become one of dentistry's most popular esthetic treatments. Acceptable whitening techniques include a dentist-prescribed in-office technique, a home-applied technique,^{2,3} or a combination of the two. The in-office whitening technique generally uses a 35% hydrogen peroxide whitening agent that can be heated or non-heated.

In the area of cosmetic dentistry, a number of techniques have been employed to fight the discoloration of teeth. These are as follows:⁴

- Bleaching of teeth
- Complete bonded crowns
- Porcelain laminate veneers
- Composite bonding or veneering
- Micro-abrasions of enamel surfaces with hydrochloric acid
- Home-applied or patient-applied bleaching gels and in office procedures



The dentist-prescribed home-applied technique most commonly uses a 10% or 15% carbamide peroxide gel.⁵

In recent years, the use of office monitored, at-home bleaching systems has increasingly gained acceptance by the dental profession. This procedure can lighten teeth and enhance the appearance of anterior teeth at a reasonable cost with a minimum amount of chair side time.⁶

The at-home bleaching products contain 10% to 15% carbamide peroxide or urea peroxide as the main ingredient. In the bleaching process, carbamide peroxide reacts with water to release hydrogen peroxide, which, in turn, liberates free oxygen radicals to remove stain and produce a whitening effect.⁷

Although office monitored, at-home bleaching systems are relatively quick and inexpensive treatments, little is known about the safety of a 10% carbamide peroxide system on gingivae.¹

Aim of the Study

The aim of this investigation was to objectively evaluate the effect of 10% carbamide peroxide gel (Opalescence™) on gingival health by measuring: (1) Bleeding Index; (2) Gingival Index; (3) Plaque Index, and (4) any side effects.

Material and Methods

Sample

Eighteen volunteers participated in the study. Eleven female and seven male subjects were included, age ranged 15-30 years (mean 24 years). The subjects were separated by gender to determine if gender had any influence on the results. All subjects were medically fit and well with healthy dentition. The discoloration of teeth was due to dental fluorosis, dietary stains (tea/coffee), smoking, and tetracycline staining. The design of the study was explained to the volunteers.

The Bleaching System

The office-monitored, at-home bleaching system with 10% carbamide peroxide (Opalescence™ Ultradent, South Jordan, UT, USA) was selected from the approved list of the American

Dental Association's bleaching products. The Opalescence system was acquired through the courtesy of Al-Turki Medical Group (AMG), Riyadh. (Figure 1)



Figure 1. Opalescence bleaching system.

The First Visit

During the first visit the following steps were carried out:

1. The bleaching procedure was explained to the volunteers and their consent was obtained.
2. A detailed medical and dental history was taken.
3. An extraoral and intraoral examination was conducted.
4. The clinical periodontal examination included:
 - Bleeding on probing (Ainamo & Bay⁸)
 - Gingival Index (Löe & Silness⁹)
 - Plaque Index (Silness & Löe¹⁰)
5. An Orthopantomograph (OPG) and a Complete Mouth, 20 film Survey (CMS) were taken.
6. Alginate impressions were taken to make study models for custom trays.
7. Shade recorded by vita shade card.

The Second Visit

During the second visit the following steps were carried out:

1. Custom trays prepared 1 mm short of gingival margin and scalloping was done.
2. The use and application of the opalescence material was demonstrated to the patients, and they were advised to use the material for 2-6 hours per day.

3. Toothbrushing was recommended before and after application of the opalescence material.

The Third Visit (3 weeks from Second Visit)

During the third visit the following steps were carried out:

1. Post treatment photographs were taken.
2. The shade change was noted.
3. The clinical parameters were measured.
4. Any change, side effect, or complication was noted.

The Data Analysis

The data was analyzed by using SPSS version 7.5 on Windows 1998 program. The descriptive statistics (mean and percentage) were generated. The baseline and post treatment percentages were compared by Wilcoxin rank sum test. A power analysis could not be done due to the small sample size.

Results

All of the eighteen subjects (11 female and 7 male) completed the study. Eleven out of eighteen subjects had dental fluorosis, while only one had tetracycline discoloration of the teeth. Four subjects had dietary stains and two were smokers. (Tables 1 and 2) The Plaque and Gingival indices were changed to a dichotomous score, i.e., present or absent to generate percentages.

Bleeding on Probing

The percentage change of bleeding on probing from the baseline was noted. The percentage change among female subjects ranged from 1% to 37%, while the change among male subjects ranged from 7% to 25%. (Tables 1 and 2) Figure 2 shows a comparison of one subject's gingiva.



Table 1: Profile of female subjects with percentage changes in clinical parameters.

No.	Age Years	Gender M/F	Type of Staining	BoP %			PII %			GII %		
				Before	After	% Change	Before	After	% Change	Before	After	% Change
1	25	F	Dietary	12.7	5.33	7.37	20.0	5.0	15.0	38.0	25.0	13.0
2	27	F	Fluorosis	15.7	7.2	8.5	40.0	35.0	5.0	50.0	41.0	9.0
3	30	F	Fluorosis	60.0	23.0	37.0	100	50.0	50.0	80.0	60.0	20.0
4	27	F	Fluorosis	11.0	10.0	1.0	30.0	20.0	10.0	32.5	30.0	2.5
5	22	F	Fluorosis	6.5	3.2	3.3	30.0	20.0	10.0	20.0	15.0	5.0
6	20	F	Fluorosis	7.8	6.5	1.3	20.0	15.0	5.0	32.0	10.0	22.0
7	23	F	Dietary	13.0	81.0	4.9	20.0	12.0	8.0	27.5	17.5	10.0
8	17	F	Tetracycline	7.0	0.0	7.0	15.0	5.0	10.0	35.6	17.8	17.9
9	24	F	Dietary	5.0	0.0	5.0	10.0	6.0	4.0	17.0	7.0	10.0
10	15	F	Dietary + non-vital teeth	10.0	4.0	6.0	15.0	8.0	7.0	60.0	35.0	25.0
11	17	F	Fluorosis	31.0	19.0	12.0	60.0	20.0	40.0	60.0	28.0	31.0

Table 2: Profile of male subjects with percentage change in clinical parameters.

No.	Age Years	Gender M/F	Type of Staining	BoP %			PII %			GI %		
				Before	After	% Change	Before	After	% Change	Before	After	% Change
1	30	M	Smoker + Fluorosis	30.0	5.0	25.0	57.0	17.0	40.0	65.0	31.0	34.0
2	21	M	Fluorosis	12.0	5.0	7.0	20.0	9.0	11.0	56.0	40.0	16.0
3	27	M	Fluorosis	30.0	15.0	15.0	40.0	17.0	23.0	60.0	40.0	20.0
4	29	M	Smoker + Fluorosis	20.0	9.0	11.0	40.0	15.0	25.0	65.5	34.0	31.6
5	24	M	Fluorosis	30.0	19.0	11.0	40.0	25.0	15.0	84.0	59.0	25.0
6	27	M	Fluorosis	30.0	17.0	13.0	40.0	18.0	22.0	65.0	30.0	35.0
7	29	M	Fluorosis	35.0	27.0	8.0	50.0	35.0	15.0	62.0	43.0	19.0
Significance:			P = ≤ 0.003	Bleeding on probing								
			P = ≤ 0.002	Gingival Index								
			P = ≤ 0.000	Plaque Index								



BaseLine



After 3 Weeks

Figure 2. Change in bleeding on probing at baseline and after three weeks (BOP).



Baseline

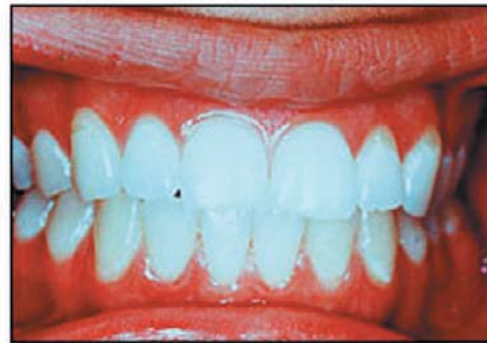


After 3 Weeks

Figure 3. Change in plaque scores in baseline and after three weeks (P11).



Baseline



After 3 Weeks

Figure 4. Change in Gingival index at baseline and after three weeks (G11).

Plaque Index

The percentage change of Plaque Index from the baseline examination ranged from 4% to 50% among females and 11% to 40% among male subjects. (Tables 1 and 2) A comparison of one subject's plaque status after three weeks is shown in Figure 3.

Gingival Index

The percentage of change in the Gingival Index from baseline was noted. The percentage change among female subjects was 2.5% to 31.5%, while it ranged from 16% to 35% among male subjects. (Tables 1 and 2) Figure 4 shows one subject's tissue status after 3 weeks.

Significance of Change

Comparison of baseline and post application examinations showed there was significant change (difference), i.e., $P < 0.002$ and $P = < 0.000$, in bleeding on probing, Gingival Index and Plaque Index respectively. P value was set at $P = < 0.05$ (significance level). (Table 2)

Side Effects

Hypersensitivity

Two of the subjects, one female and one male, complained about hypersensitivity during the first week of application of the bleaching material. The time duration of application was adjusted and both of the subjects that complained of hypersensitivity completed the study.

Gingival Irritation

None of the subjects complained about gingival irritation.

Discussion

The safety and efficacy of 10% carbamide peroxide bleaching agents for routine patients is well established. The most common side effects are tooth sensitivity and gingival irritation. However they are typically mild and transient in nature. The bleaching system (Opalescence) used in the study was based on the scientific evidence of its safety.¹

The sample size in this study is small and can be classified as a convenience sample. Good compliance by the subjects in this study can be attributed to two factors: (1) improvement in tooth discoloration and (2) the bleaching treatment was free. In the future, this type of study should be carried out with a larger sample size to compare an equal number of patients for each type of tooth discoloration tested. In our sample, the majority of the volunteers were suffering from dental fluorosis. It can be assumed that discoloration due to dental fluorosis is one of the major esthetic problems in clinical practice in the Kingdom of Saudi Arabia. Further research is needed to assess the esthetic needs of a representative sample from Saudi Arabia. Such studies should also include the use of different administration times for the bleaching process to assess variability and its impact on gingival health.

There was a marked reduction in bleeding on probing, the Plaque Index, and the Gingival Index. The Gingival Index is not a very sensitive index to assess the inflammatory changes at a cellular level. It does not examine and identify cellular changes and is limited to identifying qualitative changes in the gingival soft tissue. A newer and more sensitive index of gingival inflammation involving the examination of gingival crevicular fluid and its constituents may be appropriate.¹

A number of studies have reported a reduction in gingival inflammation and decreased plaque accumulation when a direct application of 10% carbamide peroxide solution is used.¹¹⁻¹³ The results of our study are in accord with previous findings¹ in relation to Gingival Index. The reduction in plaque, bleeding on probing, and Gingival Index may be due to (1) enthusiastic toothbrushing by the subjects and (2) effect of 10% carbamide peroxide on plaque control. Further research is needed to confirm these clinical impressions.

Two of the subjects in the present study presented with the complaint of tooth hypersensitivity. This was dealt with by reducing the bleaching time (tray for only 2 hours per day rather than 4-6 hours). Gingival irritation was not reported by any of the subjects. Using a thicker, viscous gel in a properly constructed tray that is trimmed just short of the gingival margin minimizes the amount of contact between the gel and the soft tissue.

The subjects appreciated the improvement of the shade of their treated teeth and they asked for the same treatment for their spouses. They also requested bleaching of the lower arch, but bleaching was only confined to upper arch because the sample contained material for only one arch.

Continued follow-up of these subjects is needed to see if gingival health is maintained following treatment with Opalescence. Double blind clinical trials are needed to look into other factors related to bleaching of teeth. Gingival crevicular fluid changes are needed to monitor and evaluate the inflammatory changes more objectively.

Conclusions

Within the limitations of the present study, the following conclusions were reached:

1. There was marked reduction in bleeding on probing (1% to 37%).
2. The percentage change in plaque score ranged from 4% to 50%.
3. The improvement in Gingival Index ranged from 2.5% to 35%.
4. Only two subjects complained of tooth hypersensitivity during the first week.
5. None of the subjects complained about gingival or mucosal irritation.
6. There was a statistically significant change in the clinical parameters from baseline.

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Recommendations

1. The office-monitored, at-home bleaching systems should be used under professional supervision, as per advice from manufacturers.
2. Research is needed for treatment of both upper and lower discolored dentition with the measurement of gingival crevicular fluid and its constituents to assess the inflammatory changes in gingival tissues.
3. Further research is needed using a larger sample size and a double blind study design with appropriate control groups.



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