Comparison of treatment time versus patient satisfaction in at-home and in-office tooth bleaching therapy

Jussara Karina Bernardon, PhD, Patricia Ferrari, DDS, Luiz Narciso Baratieri, PhD, and Gabrielle Branco Rauber, MDS, DDS

Vital tooth bleaching is a common procedure in contemporary dental practice. Carbamide- and hydrogen peroxide-based bleaching agents using home or in-office bleaching techniques achieve success rates as high as 100%, after different treatment times. Considering that treatment time for patient satisfaction depends on the concentration and formulation of the bleaching agent, as well as the application regimen, it is believed that highly concentrated bleaching agents would provide satisfactory results in shorter periods of time.

A clinical study of in-office bleaching techniques demonstrated that carbamide peroxide 10% (CP10%) bleaching gel used for up to 2 hours per day provided color changes similar to that with CP16% bleaching gel over the same period of time. Regarding treatment duration, it has been found that 1 month of treatment with CP10% daily for 2 hours would be required to achieve patient satisfaction. Currently, bleaching agents such as CP22% and hydrogen peroxide (HP) up to (9%) are prescribed for daily use, for periods ranging between 1 and 8 hours for at-home bleaching therapy. However, there are no studies evaluating the treatment time required for patient satisfaction that compare different concentrations of bleaching agents. Higher concentrations of CP- and HP-based bleaching agents are available to boost the perceived results of in-office bleaching technique. CP and

ABSTRACT

Statement of the problem. There are different approaches and treatment times to achieve tooth whitening.

Purpose. The purpose of this study was to evaluate the efficacy of different agents and the treatment time required to achieve participant satisfaction with at-home and in-office tooth whitening.

Material and methods. Thirty participants were selected based on the shade of the anterior teeth (between A2 and A3.5; Vita Classic Shade Guide). Each participant received both in-office and at-home bleaching agents in a split-mouth design at both arches. In-office bleaching was performed in the maxillary quadrants, applying 35% hydrogen peroxide (HP35%) (right) and 35% HP with calcium (HP35%Ca) (left) for 40 minutes/week. Home bleaching was performed in mandibular quadrants using carbamide peroxide 10% (CP10%) (right) and CP22% (left) for 2 hours/day. Bleaching treatments were performed until participant satisfaction was achieved (maximum 6 sessions [S] in the dental office or 6 weeks [W] in the home). The shade was measured with a spectrophotometer before treatment, then at 2 and 4 weeks, and at the last week for at-home bleaching; and 1 week after the second, fourth, and last sessions for in-office bleaching. Student t and Tukey-Kramer tests were used (α=.05).

Results. All bleaching agents were effective for vital tooth whitening. No significant differences were observed for color changes between CP10% and CP22% or between HP35% and HP35%Ca for all periods. Treatment times required to achieve patient satisfaction for the in-office bleaching technique were 4S (12 participants), 5S (10 participants), and 6S (8 participants); and 4W (6 participants), 5W (8 participants), and 6W (16 participants) for the at-home bleaching technique.

Conclusions. Treatment time to participant satisfaction ranged from 4 to 6 weeks regardless of the bleaching agent used in at-home and in-office therapy.
Clinical Implications
Dentists and patients should know that regardless of the bleaching protocol used, patient satisfaction took between 4 and 6 weeks for individuals with tooth shades between A2 and A3.5.

HP products with concentrations ranging between 25% and 50% are available for weekly application (up to 50-minute sessions [S]). In addition to the conventional protocol using three 15-minute application sessions, HP35% may be applied in a single 45-minute application. A number of in-office bleaching agents are suitable for direct application without needing to be reapplied during the session. Although studies show noticeable color changes at the first session with the in-office bleaching technique, the number of sessions required to reach the shade desired by the patient still needs to be determined.

The purpose of this study was to evaluate the treatment time required to achieve the result desired by the participant; that is, to determine the number of sessions for in-office and the number of weeks (W) for at-home bleaching therapy. The null hypothesis tested was that there were no differences between the groups.

MATERIAL AND METHODS
After the study obtained approval from the Committee of Ethics for Human Research, 30 participants (10 men and 20 women with teeth between shades A2 and A3.5; Vita Classic Shade Guide) were selected according to inclusion and exclusion criteria (Table 1). Four bleaching agents with different formulations (Table 2) were assigned to a split-mouth design performed in both arches of the same participant (Table 3). A silicone guide (Virtual; Ivoclar Vivadent AG) extending from canine to canine before application of the bleaching gel. Gel was aspirated after 40 minutes, and the teeth were rinsed and dried. Bleaching sessions were repeated weekly until participant satisfaction was achieved, with a maximum of 6 sessions. The color was recorded at the second (2S), fourth (4S), and the last session (LS) (maximum 6 sessions).

In the mandibular arch, at-home bleaching technique was performed with CP10% in the right quadrant and CP22% in the left quadrant; both were applied for 2 hours on a daily basis. Two silicone custom-made trays (Power Plac; BM4) without reservoirs were fabricated for the mandibular arch, and trimmed 2 mm beyond the gingival margin. Perforations were made in the region of the tray that corresponded with the teeth that should not receive the application of the bleaching gel. The trays were identified according to the bleaching product. At-home bleaching therapy continued weekly until participant satisfaction was achieved (Fig. 3). Shade was

Table 1. Inclusion and exclusion criteria for participants selected

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between 18 and 40 years of age and has time available to participate in research</td>
<td>Unable to attend follow-up appointments</td>
</tr>
<tr>
<td>Satisfactory oral hygiene, absence of periodontal disease, and without use of oral mouthwash</td>
<td>Smokers, pregnant, or breastfeeding women</td>
</tr>
<tr>
<td>No restored maxillary or mandibular anterior teeth</td>
<td>Scheduled or simultaneous periodontal treatment</td>
</tr>
<tr>
<td>Absence of tooth sensitivity (stimulated sensitivity with air syringe)</td>
<td>Previous bleaching treatment</td>
</tr>
<tr>
<td>Nonsmoker</td>
<td>Hypersensitivity as a result of root exposure</td>
</tr>
<tr>
<td>Teeth between A2 and A3.5 (Vita Classic Shade Guide)</td>
<td>Tetracycline discoloration</td>
</tr>
</tbody>
</table>

Table 2. Brand, basic composition, and application protocol of bleaching agents

<table>
<thead>
<tr>
<th>Brand (Manufacturer)</th>
<th>Code</th>
<th>Basic Composition</th>
<th>Application Protocol (Time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitiness HP Maxx (FGM)</td>
<td>HP35%</td>
<td>Hydrogen peroxide 35% Dyes</td>
<td>Office (40 min)</td>
</tr>
<tr>
<td>Whitiness HP Blue (FGM)</td>
<td>HP35% Ca</td>
<td>Hydrogen peroxide 35% Neutralizing Calcium</td>
<td>Office (40 min)</td>
</tr>
<tr>
<td>Whiteness Perfect 10% (FGM)</td>
<td>CP10%</td>
<td>Carbamide peroxide 10% Potassium nitrate Sodium fluoride</td>
<td>Office (2 h/d)</td>
</tr>
<tr>
<td>Whiteness Perfect 22% (FGM)</td>
<td>CP22%</td>
<td>Carbamide peroxide 22% Potassium nitrate Sodium fluoride</td>
<td>Office (2 h/d)</td>
</tr>
</tbody>
</table>

Table 3. Description of group divisions

<table>
<thead>
<tr>
<th>Group</th>
<th>Bleaching Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-office bleaching maxillary arch</td>
<td>HP35% HP35%Ca</td>
</tr>
<tr>
<td>At-home bleaching mandibular arch</td>
<td>CP10% CP22%</td>
</tr>
</tbody>
</table>
recorded by a spectrophotometer 24 hours before bleaching protocol at 2W and 4W and the last week (LW; maximum of 6 weeks). Student t and Tukey-Kramer tests were used ($\alpha=.05$).

**RESULTS**

Analysis of variance (ANOVA) for repeated measures rejected the null hypothesis for equality among the groups (bleaching agents). Statistically significant differences after the application of the tested bleaching agents and gradual increase in color change for the evaluated periods were observed (Table 4).

All bleaching agents were effective for vital tooth whitening. No significant differences were observed in color changes between CP10% and CP22% (at-home bleaching technique) and between HP35% and HP35%Ca (in-office bleaching) at all evaluation periods. The resulting whitening degree with HP35% was similar to that with HP35%Ca at the 2S, 4S, and LS. The resulting bleaching degree with CP10% was similar to that with CP22% at the 2W, 4W, and LW.

For the in-office bleaching method, treatment time to participant satisfaction ranged from 4 to 6S for both bleaching agents evaluated. Twelve of the 30 participants evaluated presented satisfactory results at 4W, 10 participants at 5W, and 8 participants at 6W (Tables 4, 5). For the at-home bleaching technique, the treatment time for participant satisfaction ranged from 4 to 6W, regardless of the concentration of the bleaching agent. Six of 30 participants were satisfied with their shade at 4W, 8 at 5W, and 16 at 6W (Tables 6, 7).

**DISCUSSION**

Doubts remain about the minimum time needed to achieve satisfactory results, especially when the armamentarium available to the dentist is considered. In this study, similar concentrations of bleaching agents designed for in-office techniques (HP35%) and different concentrations of at-home bleaching products (CP10% and CP22%) were considered. To allow the split-mouth design for 2 simultaneous techniques, bleaching of both arches was required. Although most clinical trials evaluate bleaching of the maxillary teeth, extending the bleaching to the mandibular teeth was necessary to compare both techniques in the same patient. This is advantageous because it eliminated or minimized other variables among patients.

A number of bleaching agents with varying protocols and application regimens have been evaluated. Frequently, the studies do not agree on the time required for patient satisfaction, although they suggest that approximately 2W for at-home bleaching and 2S of in-office bleaching therapy are advisable.2-8 Thus, extending the treatment time may not produce significant differences in the degree of final bleaching as perceived by the patient. Treatment time to achieve patient satisfaction should be considered in order to evaluate the performance of bleaching agents as proposed by this study. Because the canine teeth are the darkest teeth in both arches, their final shade was considered the references for patient satisfaction in this study.4

According to American Dental Association (ADA) guidelines,9,10 bleaching agents are found to be effective when the resulting color is at least 4 tabs lighter with a shade guide or is $\Delta E$ 3 units lower or higher with the CIELab system. According to our results, all evaluated bleaching techniques were effective after 2W, albeit giving a mild bleaching result ($\Delta E \geq 4$).
emphasizes the effectiveness of hydrogen- and carbamide peroxide-based bleaching agents, regardless of their concentration and application protocol.\(^\text{1,3,8,10-13}\) However, 2W of treatment were clearly not sufficient to achieve participant satisfaction, regardless of the technique.

The color change provided by CP10% was similar to that by CP22% for at-home bleaching in all evaluation periods, as in other clinical studies,\(^\text{2,11}\) which found no differences in the resulting degree of whitening with CP at different concentrations. The color change process was slow and gradual, regardless of the bleaching agent; this was more evident at the second week of treatment (\(\Delta E=5\)). Color change was continuous until the final week, but differences between 2W and 4W and between 4W and the LW decreased, and the resulting \(\Delta E\) value was found to be approximately 3. Spectrophotometry results revealed that all participants whose teeth had an initial tooth color between A2 and A3.5 presented a final color between A1 and B1, and all participants were satisfied with the results.

Color changes using in-office bleaching with Ca-containing HP35% were similar to those with a conventional HP35% formulation in all periods (2S, 4S, and LS) when they were used in a single 40-minute application at each session. Maximal color change was seen at the second sessions of treatment with a mean \(\Delta E\) increase of 8 units. When the color change was compared considering the initial tooth shade, \(\Delta E\) values at 6 weeks were statistically higher than the others (\(\Delta E\approx 11\)), demonstrating numerically the color variation required to achieve participant satisfaction. All patients with an initial tooth color between A2 and A3.5 reached shade A1 to B1 after 4 to 6 bleaching sessions and were satisfied. As seen in this study, bleaching agents used for in-office and at-home bleaching techniques yielded the color desired by the patient, but color change was perceived after different intervals.\(^\text{3,8,15}\) Regardless of the bleaching agent used for the at-home technique, bleaching occurred slowly and gradually, and color change was perceived by the participant only after a few days of treatment.
CONCLUSIONS

Treatment time to achieve satisfaction of participants with teeth shade A2 to A3.5 ranged from 4 to 6 weeks, regardless of the product used for at-home or in-office bleaching techniques.

REFERENCES


Corresponding author:
Dr Jussara Karina Bernardon
Amaro Antônio Vieira St, 2489, Apt 403
Florianópolis, Santa Catarina
BRAZIL
Email: jussara_bernardon@yahoo.com.br


Availability of Journal Back Issues

As a service to our subscribers, copies of back issues of The Journal of Prosthetic Dentistry for the preceding 5 years are maintained and are available for purchase from Elsevier, Inc until inventory is depleted. Please write to Elsevier, Inc, Subscription Customer Service, 6277 Sea Harbor Dr, Orlando, FL 32887, or call 800-654-2452 or 407-345-4000 for information on availability of particular issues and prices.