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Clinical Research

Clinical Comparative Study of the Effectiveness of and Tooth Sensitivity to 10% and 20% Carbamide Peroxide Home-use and 35% and 38% Hydrogen Peroxide In-office Bleaching Materials Containing Desensitizing Agents

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Clinical Relevance

For the in-office technique, lower prevalence of tooth sensitivity may be expected when using in-office 38% hydrogen peroxide (HP) agent when compared with the 35% HP agent, which may be related to the presence, type, and concentration of desensitizing agents in the bleaching agents. The use of 10% carbamide peroxide (CP) or 20% CP home-use and 35% HP or 38% HP in-office treatments may have the same effectiveness in bleaching teeth.

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SUMMARY

The aim of this study was to compare the effectiveness of and tooth sensitivity to 10% and 20% carbamide peroxide (CP) home-use bleaching agents and 35% and 38% hydrogen peroxide (HP) in-office bleaching agents, all of

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which contain desensitizing agents, in a clinical trial. Four agents were evaluated: 10% CP and 20% CP (Opalescence PF 10% and Opalescence PF 20%, Ultradent, both with 0.5% potassium nitrate and 0.11% fluoride ions), 38% HP (Opalescence Boost PF, Ultradent, with 3% potassium nitrate and 1.1% fluoride ions), and 35% HP (Pola Office, SDI, with potassium nitrate). The initial screening procedure included 100 volunteers, aged 18 to 42, with no previous sensitivity or bleaching treatment and with any tooth shade. Volunteers were randomly assigned among the technique/bleaching agent groups. A run-in period was performed 1 week before the beginning of the bleaching treatment. For the home-use bleaching technique, each volunteer was instructed to dispense gel (10% CP or 20% CP) into the trays and then insert them into his or her mouth for at least two hours per night for three weeks. For the in-office bleaching technique, the bleaching agents (38% HP or 35% HP) were prepared and used following the manufacturer's instructions, with three applications performed in each session. Three sessions were carried out with an interval of seven days between each session. The participants were evaluated before, at one week, two weeks, and three weeks after the beginning of the bleaching treatment, and again one and two weeks after the bleaching treatment ended. A shade guide (Vita Classical, Vita) was used by a blinded examiner to perform shade evaluations before bleaching and two weeks after the end of bleaching. At the time of the shade evaluations, tooth sensitivity was also recorded by asking the volunteers to classify the sensitivity during bleaching treatment as absent, mild, moderate, or severe. The present study found that 13.8% of the volunteers withdrew from the study due to tooth sensitivity, and 43.2% of the participants experienced some type of sensitivity during bleaching treatment. The χ^2 test showed that there was a significant prevalence of tooth sensitivity during bleaching treatment using the home-use 20% CP agent, with 71.4% of volunteers reporting any level of tooth sensitivity ($p=0.0032$). A low prevalence of tooth sensitivity was observed for volunteers who used the in-office 38% HP agent (15.0%). The Wilcoxon test ($p<0.05$) showed that all of the bleaching treatments were effective in bleaching teeth and that there were no differences between the final color shade results among the treatments (Kruskal-Wallis, $p<0.05$). This study showed that 43.2% of all the volunteers experienced mild or moderate tooth sensitivity during the treatment with bleaching agents. A higher prevalence of tooth sensitivity was observed for 71.4% of the volunteers who used the 20% CP home-use bleaching agent, which may be ascribed to the peroxide concentration and/or the time/length the agent was in contact with the dental structures.

INTRODUCTION

Tooth bleaching is an increasingly requested dental treatment because it is considered to be a more conservative approach to improve the color of teeth without invasive procedures such as crowns or laminated veneers. Carbamide peroxide (CP) is a well-accepted agent for home-use bleaching supervised by a dentist; the gel is applied to the external surfaces of the teeth using a customized tray.[1] In the past, a 10% CP was considered as the standard product for the home-use bleaching technique.[2] In an attempt to increase the efficacy of the bleaching agents, higher concentrations of CP were used,[3–7] as well as different concentrations of hydrogen peroxide (HP), ranging from 3% to 10%.[6,8] The main advantages of the home-use technique are the ease of use, reduced chair time, and a low incidence of tooth sensitivity and gingival irritation.[9–12] Also, some home-use agents include fluoride and/or other desensitizing products, such as potassium nitrate, in formulations that may reduce tooth sensitivity.[11] However, the in-office technique has emerged as more popular than home use because highly concentrated products may promote faster tooth whitening (the higher the bleaching solution concentration, the more quickly a shade change will occur).

The in-office systems typically use a high concentration of HP (15% to 38%) and make possible the use of light-activation devices (eg, plasma arc, light-emitting diodes, diode laser, and xenon halogen lamps) with the purpose of accelerating the whitening process. However, the use of light sources for in-office tooth whitening is still controversial.[13–15] The dentist is in complete control of the process throughout the treatment and has the option to end the treatment at any time. Usually the color change results can be observed after a single visit. Despite the advantage of the in-office method to quickly achieve tooth whitening, tooth sensitivity is usually reported.[13–19] As in the home-use agents, some manufacturers have incorporated fluoride or desen-

sitizing products into the in-office gel formulas to decrease tooth sensitivity. However, there is no information about the addition of these products regarding the decrease in tooth sensitivity and effectiveness in bleaching.

A number of clinical trials have compared the performance of high- and low-concentration agents used for home-use or in-office tooth bleaching, and some have shown a similar whitening effect regardless of the concentrations and techniques used.[9,12,20,21] Nevertheless, the incidence of tooth sensitivity or irritation gingival is more common when the agent concentration[19,21,22] or bleaching time[5,23,24] is increased.

However, due to the different techniques available for bleaching teeth (home use or in office), various concentrations of bleaching agents available in the market, and the addition of fluoride or desensitizing products in bleaching agents, it may be difficult for the dentist to choose the technique and agent that will prove to be the most effective for and least sensitive to the patients. Therefore, the purpose of this study was to compare the effectiveness of and the dental sensitivity to 10% and 20% CP home-use bleaching agents and 35% and 38% HP in-office bleaching materials containing desensitizing agents in a clinical trial. The null hypothesis tested was that there are no differences in efficacy and dental sensitivity with the use of these bleaching gels, regardless of their concentration, the technique used (home use or in office), or the presence of desensitizing agents.

MATERIALS AND METHODS

Ethics, Sample Size, Eligibility Criteria, Randomization, and Blinding

The protocol was reviewed and approved by the Research Ethical Committee of São Leopoldo Mandic School of Dentistry, Campinas, São Paulo, Brazil, prior to the start of the study. A total of 100 participants took part in this study. All participants signed an approved human informed consent form.

It was determined that a sample size of 80 volunteers would be necessary, with 20 volunteers per group. The sample size was increased to 25 volunteers per group to account for potential loss of participants or their refusal to participate.

The initial screening procedure included an anamnesis, an intraoral assessment, and a medical history form to determine the eligibility of each volunteer to enter the study. The study excluded pregnant and breast-feeding women, as well as people with active caries, periodontal disease, previous hypersensitivity, tetracycline-stained teeth, and who had received a prior bleaching treatment. The study required each participant to have six upper and six lower anterior teeth with no more than one-sixth of each buccal surface covered with a restorative material. The study included volunteers of either gender, aged 18 to 42 years, and with any tooth shade. The bleaching technique and concentration of the agent to be used (Table 1) were randomly attributed to the volunteers in an attempt to obtain an equal number (25) of volunteers per bleaching agent group by the use of a randomization table to allocate the participants to each study group. However, 94 volunteers (76 women and 18 men) were accepted to participate in this study after signing the informed consent form and meeting the inclusion/exclusion criteria of the study.

A shade guide (Vitapan Classical, Vita, Bad Säkingen, Germany) was used to perform initial baseline shade selection of the middle third of the central incisor. The researcher who evaluated the tooth shade did not know the technique or bleaching agent each volunteer used. No attempt was made to exclude participants with a lighter tooth shade of the central incisors (shade A1, for example) except the lightest one (B1), because other teeth would be darker than the shade presented by tooth 11 and the participant may require a bleaching treatment to improve the color of all teeth. At this moment, a statistical analysis was applied to detect whether there were differences in color shade of the volunteers among groups. The Fisher exact test showed that there was a homogeneous distribution of initial tooth shade color of volunteers among the technique and bleaching agents groups ($p=0.113$).

Bleaching Procedure

One week before starting treatment, a run-in period was performed for all participants to standardize the toothbrush (Oral B Classic, Procter & Gamble, São Paulo, SP, Brazil) and 1500 ppm fluoride dentifrice (Colgate Máxima Proteção Anticáries, Colgate-Palmolive, São Berbardo do Campo, SP, Brazil) used.

For the home-use bleaching techniques, alginate impressions (Jeltrate, Dentsply International, Milford, DE, USA) of both arches of each participant were obtained to prepare stone molds (Gesso pedra, Vigodent S/A Ind. Com., Rio de Janeiro, RJ, Brazil). No preparations with reservoirs were made because no differences in effectiveness[25] and no higher rates and intensity of gingival inflammation[26] have been

Table 1: *Bleaching Techniques, Bleaching Agents, Composition, Manufacturer, pH Measure, and Lot Number of the Agents Used in the Study*

Bleaching Techniques	Bleaching Agents	Composition[a]	Manufacturer	pH Measured	Lot Number
Home-use bleaching technique	Opalescence PF 10%	10% carbamide peroxide, 0.5% potassium nitrate, and 0.11% fluoride ions (1000 ppm); pH ~6.5	Ultradent Products, South Jordan, UT, USA	7.1	B51JR
	Opalescence PF 20%	20% carbamide peroxide, 0.5% potassium nitrate, and 0.11% fluoride ions (1000 ppm); pH ~6.5	Ultradent Products, South Jordan, UT, USA	7.2	B3NVC
In-office bleaching technique	Opalescence Boost PF 38%	38% hydrogen peroxide, 3% potassium nitrate, and 1.1% fluoride ions (10000 ppm); pH ~7.0	Ultradent Products, South Jordan, UT, USA	6.6	B3VFR; B563J
	Pola Office 35%	Liquid: 35% hydrogen peroxide, distilled water, and stabilizers. Powder: thickener, catalyst, pigments, and potassium nitrate (unknown concentration); pH ~7.0	SDI Limited, Bayswater, Victoria, Australia	2.6	083011; 082776; 082547

[a] *The exact percentage of these additives is proprietary.*

found. All teeth of both arches were to be bleached and thus were included in the trays. The trays and three bleaching gel tubes were given to each volunteer with instructions to dispense the gel into both trays and then insert them into the mouth for at least two hours per night for three weeks.[12]

For the in-office bleaching technique, the bleaching agent was prepared and used following the manufacturer's instructions. The gingivae of all teeth to be bleached were isolated with either OpalDam (Ultradent, South Jordan, UT, USA) light cured resin (for Opalescence Xtra Boost/ Ultradent, South Jordan, UT, USA) or Gingival Barrier (SDI Limited, Bayswater, Victoria, Australia) (for Pola Office/ SDI Limited, Bayswater, Victoria, Australia). To prevent saliva from flowing through embrasures of anterior teeth, a saliva ejector and cotton rolls were used in the sublingual region. An expanded lip retractor was used to protect lips.

For Opalescence Boost PF, the activator was mixed into the bleaching agent using the proper syringe. For Pola Office, the powder was mixed into the liquid using a brush applicator to obtain a homogeneous gel. For both products, the mixture was then applied 1–2 mm thick on the buccal surfaces of the teeth (second premolar to second premolar) of both arches and remained on for eight minutes. No heat or special lamps were used to complete the process. The agent was removed using suction and gauze only for a new application. After the last application, teeth were rinsed with water and the gingival isolation and lip retractor were removed. A total of three applications were completed in each session. There were three sessions with an interval time of seven days between each session.

All participants were advised to avoid darkened foods and beverages during bleaching as much as possible and to not use any kind of mouth rinses. For the home-use bleaching group of volunteers, written instructions concerning the proper use of the bleaching agent were given. Instructions were also given to call the main researcher or to cease using the treatment solutions if tooth sensitivity or gingival irritation was perceived as too great to tolerate.

At one, two, and three weeks after the beginning of the bleaching treatment, the participants of the home-use bleaching were assessed; at the same time, participants of the in-office technique were receiving their bleaching treatments. All participants were also evaluated one and two weeks after the end of the bleaching treatment. At the final evaluation appointment, the blinded researcher determined tooth shade by following the same protocol used at

Table 2: *Prevalence of Tooth Sensitivity Reported by Volunteers (Absolute and Percentage) During Bleaching Treatment According to Technique/ Bleaching Agent*[a]

	Absence		Presence		Total
	n	%	n	%	n
Home-use 10% CP	12	63.2	7	36.8	19
Home-use 20% CP	6	28.6	15	71.4	21
In-office 35% HP	11	52.4	10	47.6	21
In-office 38% HP	17	85.0	3	15.0	20
Total	46	56.8	35	43.2	81

[a] *χ^2 test, $p = 0.0032$.*

baseline. Tooth sensitivity also was recorded at this time by the same blinded researcher asking the volunteers to classify the sensitivity during bleaching treatment as absent, mild, moderate, or severe. If the sensitivity was severe enough that the volunteer stopped using the bleaching agent, the volunteer was withdrawn from the study.

Although the manufacturers stated the pH of the agents, an evaluation was made by using a fresh portion of each agent either extruded by the syringe (home-use agents) or recently mixed (in-office agents). A measurement in triplicate was performed using a pHmeter (MS Tecnopon Equipamentos Especiais Ltda, Piracicaba, SP, Brazil) (Table 1).

Statistical Analysis

The data were tabulated in an Excel program for each volunteer according to bleaching technique/ concentration, gender, tooth sensitivity, and tooth shade of the right central upper incisor and submitted to exploratory analysis. The selected tab in the shade guide was converted to previously established numeric values[9,13,21] ranging from 1 (B1) to 16 (C4) in decreasing order of value: B1, A1, B2, D2, A2, C1, C2, D4, A3, D3, B3, A3.5, B4, C3, A4, and C4. The smaller the numeric value, the lighter the tooth. The comparison between shade color before and after each treatment was analyzed by the Wilcoxon nonparametric test. The comparisons of shade color between volunteers among the technique and bleaching agents groups before and after the bleaching treatments were analyzed by the Kruskal-Wallis test. The associations among variables were analyzed by the χ^2 test (Bioestat 5.0 statistical program, Mamirauá Maintainable Development Institute, Belém, Brazil) or the Fisher exact test (Release 9.2, SAS Institute Inc, Cary, NC, USA) when at least one of the variables was less than 5. The significance level was 5%.

RESULTS

There was a homogeneous distribution of volunteers among the technique and agent bleaching groups, with 25 volunteers for 20% CP, 24 volunteers for 10% CP, 24 volunteers for 35% HP, and 21 volunteers for 38% HP. Some volunteers withdrew from the experiment due to extreme sensitivity during the bleaching treatment. A total of 13.8% of the volunteers withdrew from the study: five from 10% CP, four from 20% CP, three from 35% HP, and one from 38% HP.

There was a significant prevalence of tooth sensitivity during the bleaching treatment with the home-use 20% CP agent, with 71.4% of the volunteers reporting any level of tooth sensitivity (p=0.0032). A low prevalence of tooth sensitivity was observed for volunteers who used the in-office 38% HP agent (15.0%). The present study found that 43.2% of the participants experienced some type of sensitivity during the bleaching treatment (Table 2).

When tooth sensitivity was reported (Table 3), there was mild sensitivity when volunteers used the 10% CP home-use agent (85.7%). Severe sensitivity that did not compromise the continuity of the bleaching treatment was reported by volunteers who used 20% CP home-use agent (6.7%) and 35% HP in-office agent (10.0%).

There were no significant differences among groups in tooth color shade of volunteers after the end of the treatments among technique/bleaching agents groups (Table 4). All volunteers obtained a lighter shade color after the bleaching treatment, showing its effectiveness (Table 5). All the technique/bleaching agents had the same effectiveness (Table 6).

DISCUSSION

Tooth sensitivity is the most common adverse side effect of bleaching. It is related to the increase in enamel and dentin permeability and the consequent easy passage of the peroxide through the enamel and dentin to the pulp.[23,27,28] Although the great majority of people are able to tolerate tooth whitening, sensitivity related to tooth whitening is a critical

Table 3: *Intensity of Perceived Tooth Sensitivity Reported by Volunteers (Absolute and Percentage) During Bleaching Treatment According to Technique/ Bleaching Agent*

	Mild		Moderate		Severe	
	n	%	N	%	n	%
Home-use 10% CP	6	85.7	1	14.3	0	0.0
Home-use 20% CP	10	66.7	4	26.6	1	6.7
In-office 35% HP	6	60.0	3	30.0	1	10.0
In-office 38% HP	2	66.7	1	33.3	0	0.0
Total	24	68.7	9	25.6	2	5.7

problem. Studies have shown that the prevalence of sensitivity during home-use or in-office bleaching treatments varies from 0% to 100% of participants.[9,10,13,20,21,23,29,30] Bernardon and others[21] reported a higher rate of tooth sensitivity for the in-office bleaching treatment compared with the home-use technique, although other studies showed similar levels of tooth sensitivity when comparing both techniques.[9,19,20,31] This suggests that tooth sensitivity is not only related to the high peroxide concentration used in the in-office techniques but is also a symptom that may vary greatly from person to person.[10] In this study, 43.2% of volunteers experienced some sensitivity during the treatment with bleaching agents. With home-use bleaching agents, 71.4% who used 20% CP experienced tooth sensitivity vs 15% of volunteers who used the in-office 38%

Table 5: *Prevalence of Volunteers Who Showed Color Change According to Vita Shade Guide Scale*[a]

Initial Shade Color Tooth	Final Shade Color Tooth				
	B1	A1	A2	C2	B3
A1	9	(–)	(–)	(–)	(–)
B2	3	2	(–)	(–)	(–)
A2	16	12	(–)	(–)	(–)
A3	5	12	3	(–)	(–)
B3	(–)	1	(–)	(–)	(–)
A3.5	1	3	5	(–)	(–)
B4	1	(–)	(–)	(–)	(–)
C3	(–)	(–)	(–)	2	(–)
A4	(–)	(–)	2	(–)	1

[a] *Fisher exact test,* p = *0.7291.*

Table 4: *Prevalence of Color Shade in Volunteers (Absolute and Percentage) at the End of Bleaching Treatment According to Technique/Bleaching Agent*[a]

Shade	Home-use 10% CP		Home-use 20% CP		In-office 35% HP		In-office 38% HP		Total	
	n	%	n	%	n	%	n	%	n	%
B1	10	28.6	14	40.0	4	11.4	7	20.0	35	44.8
A1	5	16.7	5	16.7	13	43.3	7	23.3	30	38.5
A2	3	30.0	1	10.0	3	30.0	3	30.0	10	12.8
C2	1	50.0	0	0.0	0	0.0	1	50.0	2	2.6
B3	0	0.0	0	0.0	0	0.0	1	100.0	1	1.3
Total	24	30.8	25	32.1	24	30.8	21	26.9	78	100

[a] *Fisher exact test, p = 0.0501.*

Table 6: *Median, Minimum, and Maximum Values of Shade Color Tooth Before and After Bleaching Treatments and the Comparison by Wilcoxon Test*

Technique/Bleaching Agent	Before			After		
	Median[a]	Minimum	Maximum	Median	Minimum	Maximum
Home-use 10% CP	5 Aab	2	15	1 Ba	1	7
Home-use 20% CP	5 Ab	2	12	1 Ba	1	2
In-office 35% HP	9 Aa	5	15	2 Ba	1	5
In-office 38% HP	5 Aab	3	15	2 Ba	1	11

[a] *Medians followed by different letters (capital letters in rows and lowercase in columns) are different by Wilcoxon ($p<0.05$) and Kruskal-Wallis ($p<0.05$) tests, respectively.*

HP. This also shows that sensitivity may not only be related to the peroxide concentration but most likely is related to the time/length the application is in contact with the dental structure (higher for home-use agents), as well as to the presence, type, and concentration of desensitizing agents in the composition. Thus, the null hypothesis regarding dental sensitivity response was rejected. Moreover, the tooth sensitivity was considered mild or moderate, and only 13.8% of the participants in both techniques experienced enough extreme sensitivity to force them to withdraw from the study. Schulte and others[29] found that sensitivity was severe enough to cause 14% of the participants to discontinue the home-use bleaching 10% CP agent, although other studies showed no volunteers who withdrew from the study when using the home-use agents.[10,20] In this study 13.8% of the volunteers declined continuing the treatment due to sensitivity: 9.5% from the home-use treatment and 4.3% from the in-office bleaching treatment.

Although tooth sensitivity is generally reported immediately after the application of the in-office agents[13] or during the first few days of using the home-use bleaching treatment,[10] these events are generally mild and resolved during or on completion of the treatment.[16,32] In this study, tooth sensitivity records were reported at the end of the treatment as a way to evaluate the volunteer's perception of the bleaching technique used.

In an attempt to decrease or limit the side effects of dental sensitivity during bleaching, manufacturers have introduced different desensitizing agents into the composition of the bleaching agent, such as potassium nitrate, sodium fluoride, or amorphous calcium phosphate.[33] Dentists have done their part by using different techniques prior to or in association with the bleaching treatment, such as using of fluorides as desensitizing agents on a tray, or prescribing these products as mouth rinses or dentifrices, or topically applying them on the external surfaces of the teeth.[30,32,34,35]

The home-use agents evaluated in this study contain potassium nitrate and sodium fluoride, which have been shown to efficiently and significantly reduce postoperative sensitivity.[11] It is believed that potassium nitrate reduces dental sensitivity by decreasing the ability of nerve fibers in the dental pulp to repolarize after an initial depolarization due to pain sensation. Fluoride may be added to the bleaching agent's composition because it also may decrease sensitivity by blocking the dentin tubules, thus reducing fluid flow to the pulp chamber.[36] Some studies showed that the use of 10% CP with potassium nitrate and fluoride[37] or the use of 16% CP with amorphous calcium phosphate[38] significantly reduced the amount of sensitivity. Also, Matis and others[33] found no differences in sensitivity when comparing 15% CP containing potassium nitrate and fluoride with 16% CP containing amorphous calcium phosphate. Although the same concentration of desensitizing agents (0.5% potassium nitrate and 0.11% sodium fluoride) were formulated for different concentrations of the home-use bleaching agents (10% and 20% CP), a significantly higher sensitivity was experienced by the volunteers who used the 20% CP (71.4%) than by those who used the 10% CP (36.8%) (Table 2), using the same protocol

for both. For the group of volunteers who used the 20% CP agent, there was a higher prevalence of moderate or severe sensitivity than for those who used the 10% CP (Table 3). Thus, in comparing the home-use products, it can be suggested that a high concentration of CP may be related to a higher prevalence of tooth sensitivity.[19,21,22]

For the in-office bleaching treatments, a higher prevalence of tooth sensitivity was experienced by those volunteers who used the 35% HP agent than by those who used the 38% HP agent (47.6% and 15%, respectively, reporting some level of tooth sensitivity). Although the manufacturer of 35% HP does not mention the concentration of potassium nitrate contained in the formula, the results of a lower prevalence of tooth sensitivity for 38% HP may be related to the type and concentration of the desensitizing agents (3% potassium nitrate and 1.1% fluoride ions). This corroborates Al Shethri and others[17] who found no differences in tooth sensitivity when comparing 35% HP with 38% HP in-office agents. Thus, for the in-office bleaching agents, tooth sensitivity may not be related to the concentration of the bleaching agent used, as opposed to what was found for the at-home agents, but to the type and concentration of desensitizing agents used.

This study also confirmed that low-concentration bleaching agents can provide effects similar to those obtained with high concentrations, as shown by Kihn and others,[4] Matis and others,[5] Braun and others,[7] and Leonard and others.[23] Therefore, the null hypothesis, when considering the efficacy of bleaching, was accepted. A meta-analysis of seven clinical studies indicated a significant mean change from baseline of 6.4 shade-guide units, according to the Vitapan guide scale (Vita), by the use of tray-based bleaching systems using 10% CP gels.[39] In this study, a median change from baseline of 4 to 7 shade-guide units was observed for all techniques, confirming that all bleaching treatments were effective, without any differences of final color shade obtained with all treatments. Also, regardless of the initial color shade of the upper central incisors, 83% of the volunteers obtained the lighter shade colors (B1 or A1) of the Vita guide scale after treatment. In this study, the shade color was evaluated with a subjective method: visual examination with the aid of the shade guide. Although an objective method (such as the use of a spectrophotometer) would be more precise and without the influence of the examiner and illumination conditions, similar results regarding color change were observed in studies that used both evaluation methods,[9,13,21] showing that the subjective method is a reliable, practical, and useful method to evaluate color changes.

The effectiveness of the bleaching treatment is one of the major factors to be considered when choosing a bleaching technique or agent, but longevity, safety, and the patient's convenience should also play an important role in selecting the bleaching treatment. This study found no clinically significant differences in bleaching, which corroborates Giachetti and others,[31] who performed a clinical trial comparing at-home bleaching treatments with in-office bleaching treatments. Meireles and others[22] and Giachetti and others[31] showed that a higher CP concentration does not increase the longevity of the whitening effect of home-use tooth-bleaching agents. Da Costa and others[19] also verified that subjects preferred, and would recommend, the home-use bleaching technique over the in-office technique.

The results of this study indicate that 10% CP or 20% CP home-use treatments and 35% HP or 38% HP in-office treatments are effective bleaching procedures to whiten teeth. However, the 20% CP home-use treatment was found to produce more sensitivity than other techniques/agents, even though desensitizing agents were incorporated into the product. The technique preference of the dentist and patient, composition and concentration of the bleaching agents, side effects involved (such as tooth sensitivity), and effectiveness must be taken into consideration when choosing the safest bleaching treatment for the patient.

CONCLUSION

This study showed that 43.2% of the volunteers experienced mild or moderate tooth sensitivity during the treatment with bleaching agents. A higher prevalence of tooth sensitivity was observed for 71.4% of the volunteers who used the 20% CP home-use bleaching agent. This may be ascribed to the peroxide concentration and the time/length application of the agents in contact with the dental structure. For the in-office technique, a low prevalence of tooth sensitivity was observed for the volunteers who used the 38% HP agent when compared with those who used the 35% HP agent. This may be related to the presence, type, and concentration of the desensitizing agents in the composition. The use of the 10% CP or 20% CP home-use and the 35% HP or 38% HP in-office treatments have the same effectiveness in bleaching teeth.

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Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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