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RESEARCH ARTICLE

EFFECT OF THREE DIFFERENT DESENSITIZING TOOTHPASTES ON PAIN INDUCED BY IN-OFFICE BLEACHING: A COMPARATIVE CLINICAL STUDY

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ABSTRACT

Aim: to evaluate whether the use of desensitizing dentifrices used 15 days prior to and after in-office tooth bleaching could eliminate or reduce tooth sensitivity.
Materials and Methods: 60 subjects were selected and divided into 3 groups according to the dentifrice selected: Colgate Total (CT), Colgate Sensitive Pro-Relief (CS) or Sensodyne ProNamel (SP). The subjects used toothpaste and a toothbrush provided to them for 15 days prior to bleaching. They were then submitted to two in-office bleaching sessions (Whiteness HP Blue Calcium). Their tooth sensitivity was assessed using the Visual Analog Scale (VAS) for a week after each session. Their tooth shade alteration was measured with a Vitapan Classical shade guide to determine if the dentifrices could influence the effectiveness of the bleaching agent.
Results: The use of desensitizing dentifrices did not affect the bleaching efficacy. In regard to tooth sensitivity, there was a statistically significant difference between the results of the Control Group and Group T2 after the first session ($p = 0.042$). There was no statistically significant difference in the results for the other groups after the first session. In regard to the second session, there was no statistically significant difference in the results for all the groups.
Conclusion: The use of a desensitizing dentifrice containing nitrate potassium reduced tooth sensitivity during the bleaching regimen. Dentifrices containing arginine and calcium carbonate did not reduce tooth sensitivity. Color change was not influenced by the dentifrices used.

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INTRODUCTION

Bleaching is the most conservative treatment for discolored teeth. Since the introduction of carbamideperoxide for at-home bleaching, new techniques have been developed (Haywood and Heymann, 1989). Although at-home bleaching achieves a high success rate and is the most widely used technique by clinicians for bleaching vital teeth, some patients do not want to use a bleaching tray or do not want to wait two to three weeks to see the results of the treatment. These patients typically prefer a method that produces more immediate results. In such cases, in-office bleaching is a popular option for patients desiring whiter teeth. A dental professional performs in-office bleaching the same day the patient visits the dental office. This method of tooth-whitening has been around for many years and remains popular because results can be seen after one appointment (although two or three visits usually are needed to achieve satisfactory results). Despite the fact that bleaching systems have become increasingly popular, tooth-whitening procedures may cause gingival irritation and tooth sensitivity. In several studies of 10 percent carbamide peroxide, between 15 and 65 percent of patients reported experiencing increased tooth sensitivity (Haywood *et al*., 1994; Schulte *et al*., 1994; Leonard *et al*., 1997; Tam, 1999). Brännström's hydrodynamic theory is the most accepted explanation for tooth sensitivity and posits that it is caused by fluid movement inside the dentinal tubules (Charakorn *et al*., 2009). Recently, it has been hypothesized that sensitivity after bleaching differs from tooth sensitivity to cold and tactile stimuli, which are usually associated with root dentin exposure (Markowitz, 2010). Sensitivity after whitening probably occurs as a consequence of

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the functional properties of a chemosensitive ion channel called TRPA1 (transient receptor potential cation channel with ankyrin domain-type 1). This ion channel is associated with the pain caused by oxidants, including hydrogen peroxide. Since the afferent fibers of primary dental pulp contain TRPA1, it is possible that direct TRPA1 activation of nerve fibers is involved in the pain caused by tooth bleaching (Markowitz, 2010). Several approaches to reducing sensitivity after dental bleaching have been suggested. The use of fluoride (Armênio *et al*., 2008; Tay *et al*., 2009) and treatment with nonsteroidalantiinflammatory drugs (NSAIDs) lead to a significant reduction in post-operative sensitivity (Charakorn *et al*., 2009). Anti-sensitivity dentifrices are another option for reducing the adverse effects of bleaching agents (Browning *et al*., 2010). These products act by:

1. Reduction in the excitability of nerve fibers present in the pulp
2. Obliteration of dentinal tubules

A reduction in the excitability of nerve fibers could occur due to the diffusion of potassium salt through the enamel and dentine. These salts can reach the nerve terminations, affect nerve impulse transmission and result in a reduction or deletion of pain.20 The obliteration of dentinal tubules after using strontium chloride results in a reduction in dentin permeability and blocks the hydrodynamic mechanism (Ajcharanukul *et al*., 2007; Cummins, 2009). Thus, the aim of this study was to evaluate the efficiency of different desensitizing agents (potassium nitrate and arginine / calcium carbonate), contained in two dentifrices, in reducing tooth sensitivity in patients submitted to an in-office bleaching protocol. In addition, the influence on tooth color was evaluated.

MATERIALS AND METHODS

Prior to start of study consent from institutional ethical review board and pre-informed written consent was obtained. The inclusion criteria was age between 18-30 years, presence of all six maxillary teeth equal or darker than shade D2 in the Vita Classical Guide in the value order ,no dental pain, non-smoker, absence of cervical lesion and root exposure and absence of dental hypersensitivity to cold and/or heat .The exclusion criteria was presence of restoration in the six anterior teeth, involving the labial surface or labially passing the contact area from the lingual surface, candidates with gross pathology within the oral cavity, pregnant or lactating women, presence of calculus or heavy stain on the study sites, c and idates who recently used or currently use drugs, alcohol or over-the-counter pain relievers and desensitizing toothpaste or over-the counter desensitizers. On the first visit, tooth sensitivity was verified using a syringe with air spray positioned 2 millimeters from the buccal surfaces of the upper anterior teeth for 2 seconds. The patients who fulfilled all the prerequisites were given details of the bleaching procedure and were included in the research. Selected patients were randomly divided into three groups (n = 20), each of which was assigned a dentifrice. Each patient received a soft toothbrush (Colgate ultra-soft tooth brush) and both the patient and the operator were blinded. The toothbrush and toothpaste were used by the patients for 15 days before the first bleaching session. Fifteen days later, tooth color of the upper right canine was evaluated using Vitapan Classical guide. The first in-office bleaching session was performed in the maxillary arch using the whitening gel (35% HP, Pola office bleach, Dental Avenue). Each participant was instructed to maintain a record of tooth sensitivity daily for one week, using an analogue visual scale that ranged from 0 to 10 (0 = no sensitivity /10 = maximum sensitivity). Seven days later the patient visited for first follow-up wherein all the procedures were repeated. One week after the second bleaching session, new color evaluation was performed. Values ranging from 1 (B1) to 16 (C4) were determined for each Vitapan Classical Guide shade, and the color change was assessed based on the difference between the initial and final colors. Data thus obtained was subjected to statistical analysis.

RESULTS

The results showed a statistically significant difference between groups CT and SP only in the first week of evaluation. When comparing the two evaluations (first and second) for any same group, no statistically significant difference was observed (Table 1). Color changes were observed through visual analysis based on a scale. There was no statistically significant difference between one group and the other. (Table 2)

Table 1. Inter-group comparison of dental pain sensitivity

Group	After 1st session	After 2nd session	p-value
Colgate Total (CT)	1.89±0.56	1.56±2.1	0.540
Colgate Sensitive Pro-relief(CS)	1.53±0.89	1.04±2.2	0.347
Sensodyne Pro Namel (SP)	0.92±1.1	0.92±1.1	0.874
p-value	0.042	0.236	

Table 2. Inter-group comparison of teeth whitening

Group	Baseline	Final	p-value
Colgate Total (CT)	12.57±1.6	5.45±1.8	0.002
Colgate Sensitive Pro-relief(CS)	12.81±0.8	5.91±1.2	0.002
Sensodyne Pro Namel (SP)	11.65±3.2	5.23±2.04	0.002
p-value	0.761	0.94	

DISCUSSION

The results of this study show that in-office bleaching is an effective procedure. Considering that no significant difference was observed in color change between the groups evaluated, it can be assumed that the dentifrices did not influence the bleaching results. A study using bleaching with 35% hydrogen peroxide and color evaluation using the Vita Classical shade guide showed a color change (6.15 units) similar to that of our research results (6.3 units) (Tay *et al*., 2009). In another study a variation of 2.1 to 3.7 units was noted after each in-office whitening session (de Silva Gottardi *et al*., 2006). Two approaches are currently used for preventing tooth sensitivity. The first is based on the hydrodynamic theory and aims at reducing tooth permeability. The second strategy uses substances to diminish the excitability of nerve fibers in the dental pulp (Sowinski *et al*., 2001). Therefore, dentifrices with these two mechanisms of action were selected for the study, in addition to the control group. Compared with the control group,

the group of patients who used the dentifrice containing potassium nitrate showed a statistically significant reduction in tooth sensitivity during the first week after the first bleaching session. Haywood *et al*. conducted a similar study and reported that the patients who used potassium nitrate dentifrice had longer period without experiencing sensitivity (10.1 days) than the control group (8.6 days) (Sowinski *et al*., 2001). Another research study concluded superior efficacy of potassium nitrate than fluoride in decreasing tooth sensitivity after at-home bleaching (Armênio *et al*., 2008).

Conclusion

The use of 5% potassium nitrate dentifrice reduces tooth sensitivity caused due to bleaching. Color change was not influenced by the dentifrices used.

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