

Qualitative and Comparative Clinical Evaluation of the Immediate Effect of Two Bleaching Materials in the Office-Case Technique

Bruna Paula Nunes Pimenta Barbosa¹, Isabela Fernanda Furlan¹, Daniel Nunes Spezamiglio Nunes², Vanda Rieko Fujita Miyazaki^{1,2}, Leandro Moreira Tempest^{1,2}, Patricia Garani Fernandes^{1,2}, Taylane Soffener Berlanga De Araujo^{1,2*}

¹University Center North Paulista (Unorp), Sao Jose do Rio Preto, SP, Brazil

²Post Graduate and Continuing Education (Unipos), Sao Jose do Rio Preto, SP, Brazil

*Corresponding author: Taylane Soffener Berlanga, Professor, Unorp/Unipos - Post Graduate and Continuing Education, Sao Jose do Rio Preto-SP, Brazil, Tel: 55 17-997613629; E-mail: taylane@terra.com.br

Received date: 27 April 2018; Accepted date: 08 May 2018; Published date: 17 May 2018

Copyright: © 2018 Barbosa BPNP, et al. This is an open-access article distributed under the terms of the creative commons attribution license, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Citation: Barbosa BPNP, Furlan IF, Nunes DNS, Miyazaki VRF, Tempest LM, et al. (2018) Qualitative and Comparative Clinical Evaluation of the Immediate Effect of Two Bleaching Materials in the Office-Case Technique. Health Sci J. Vol. 12 No. 3: 565.

Abstract

Introduction: Dental dimming, especially in anterior teeth, greatly undermines the individual's confidence. Although the whitening result can't be predicted as to the success rate, as far as the appearance of the teeth is concerned, can reach 92%.

Objective: The present work had as objective to demonstrate a clinical research where it was visibly compared the whitening effect between two office bleaching agents on vital teeth, being the 35% hydrogen peroxide and 37% carbamide peroxide, applied with hemi-arcade division. A review of the literature on the evolution and consequent importance of the improvement whitening techniques.

Methods: Two patients treated at the dentistry clinic of Unorp, where the office bleaching carried out with the agents based on hydrogen peroxide 35% and carbamide peroxide 37% applied with the same technique. For this, the patients' dental arches divided in half with the placement of a polyester strip between the proximals of the central incisors for dividing the hemiarcs to start the bleaching technique. The right and left quadrants then received the corresponding whitening gel.

Conclusion: There was no visual difference between the bleaching gels employed, thus, both materials have good clinical results.

Keywords: Hydrogen Peroxide; Carbamide peroxide; Home bleaching; Office whitening

Introduction

Performing cosmetic treatments is so subjective, because each individual has a standard regarding aesthetics; of course, there is a very large imposition of the media on aligned and clear teeth [1,2]. Beyond the eternal search for the fountain of youth and for this to be achieved, there are multitudes of treatments and measuring the results of these is very difficult.

Dental dimming, especially in anterior teeth, causes discomfort to the individual and greatly undermines his confidence in smiling, causing a negative impact on their quality of life [3]. A dental bleaching is an excellent option for minimally invasive aesthetic solutions and which can be applied alone or in conjunction with other treatments, and the main factor to be considered is the patients' perception of the results achieved [4].

Although bleaching is not a procedure with predictable results the success rate, as regards the appearance of the teeth, can reach 92% [5], but for this success to be achieved it is necessary to correctly diagnose the type of color change, planning the best way to solve the problem. Since 1868, tooth whitening has been increasingly used [6].

Therefore, the purpose of this clinical study was to compare the degree of bleaching visibly in clinical application between two office bleaching agents in vital teeth, being the 35% hydrogen peroxide and 37% carbamide peroxide.

Literature revision

Dental color changes may be extrinsic, caused by external factors such as food colorings and ingested foods, smoke and chromogenic bacteria that are easily removed by prophylaxis or in some cases microabrasions [7]. Already the intrinsic alterations can be acquired or congenital [8], harder to remove. The acquired ones can have diverse causes like trauma, disorders, ingested medicines and physiological. In the

congenital occurred in the formation of the structure of the dental germ. These indicated for whitening and in more severe cases of darkening there is a need for more invasive treatments [9].

Stain bleaching occurs by the oxidizing action of hydrogen peroxide. In addition, before starting tooth whitening it is necessary to know and determine the type of peroxide; hydrogen or carbamide, which technique; office, home-supervised or combined techniques and still define the best concentration of these agents [10]. Besides the knowledge of the material to be chosen for each case it is necessary to decide the treatment to know the severity and type of color change, how much time there is darkening, how many teeth will be involved in the treatment and how sensitive the patient is, these are criteria that influence the technique to be chosen [11]. These criteria are fundamental for treatment success without generating unrealistic expectations and consequent patient satisfaction [12,13].

Clinical protocol

An order to perform the whitening in the office it is imperative to protect the soft tissues, either by means of absolute isolation or by application of the light-curing gingival barrier, mouth opening and protection of the labial mucosa with (triamcinolona acetona) thus avoiding burns and unpleasant sensations to the patient. After this phase of well-protected protection makes the application of the peroxide chosen, be it carbamide or hydrogen, the dentist must control the time and the complete treatment [14,15].

Hydrogen peroxide is the bleaching agent most used in the bleaching of vital teeth, usually in the concentration of 35%. It has an immediate result, with a longer service time, but its cost may be higher. Hydrogen peroxide breaks down into free radicals breaking molecules, diffusing freely through the enamel and dentin structures, which are permeable facilitating the diffusion of oxygen to act on the pigmented structures of the teeth, brightening them [11,16,17].

Through a literary review, they evaluated the adverse effects of dental whitening [18]. The main agent being used hydrogen peroxide this review has shown that they have insignificant and reversible adverse effects, being a satisfactory and effective technique with correct clinical indication. Carbamide peroxide is a bleaching agent, which, in close contact with water present in the dentin tubules and saliva, degrades in hydrogen peroxide and urea [19]. 35% carbamide peroxide causes mild and moderate surface roughness of the enamel these effects were also found in 35% hydrogen peroxide [20]. Thus, clinically it is necessary that such agents be used with caution [21-23].

When thinking about gingival irritation and dentin sensitivity [24], in a clinical study, compared the effect of two bleaching agents both, hydrogen peroxide, but at different concentrations being 35% and 38% and found that there were no significant side effects and relapse of staining remained until the fifth week after that there was no significant change.

The use of halogen lamps tested to verify its effectiveness in the technique of bleaching in the office with hydrogen peroxide at 37.5% and there was no significant change in whitening [25].

Risks of bleaching treatment

Due to the controversy regarding the effects and risks of bleaching treatment, several researches being done to clarify possibilities such as safety, longevity, aggressions to soft and hard tissues, carcinogenic potential among other factors [26-29]. According to these studies, the sensitivity is the main problem reported regardless of the method used, even ceasing before the end of treatment [30].

Another factor investigated are the changes that occurred in enamel structures, such as possible dental bleaching problem, however, it was verified that the concentrations of Calcium and Phosphorus in the enamel did not present alterations when compared before, during and after the bleaching treatment both home and office [16].

Three 15-minute applications of hydrogen peroxide in one session are more efficient and promotes less sensitivity when compared to the 45-minute direct session. Due to the low pH of the bleaching agent, this may alter the micro hardness of the enamel, but after the removal of this agent and the contact of this enamel with the saliva this minimizes this adverse effect [31,32].

There are also inter-tubular changes and a reduction in the hardness values of the dentin surface due to the oxidative effects of hydrogen peroxide, besides the pH found in the agent [33].

Bleaching agent's 35% hydrogen peroxide and 37% carbamide peroxide affected the surface roughness of nanohybrid and microhybrid composite resins [34]. The resins can also undergo changes, however easily eliminated with a good polishing [35].

In this way, we can affirm that dental bleaching, like any dental treatment, has risks, however, this much more related to wrong indication, abuse in use and incorrect application [36]. In research it was seen that dental sensitivity during and after the bleaching treatment affects 52% of the evaluated subjects, with 31% of this sensitivity being related to gingival irritation [37] or technical error in the placement of the gingival barrier or insulation. In addition, in the vast majority of these discomforts were mild or moderate and transient [38].

Adhesiveness

In study Cunha [19], the effect of hydrogen peroxide at 35%, in the bonding strength of adhesive systems based on acetone, alcohol and first auto conditions to dental enamel, in periods of time of 24 hours, 7 days and 14 days. Through the results obtained, the hydrogen peroxide at 35% did not alter the bonding strength of composite resin restorations to dental enamel, independent of the adhesive system used at the times tested.

However, this research redone after one year and the results showed different when there was a decrease in the efficacy of adhesive resistance to dentin when the adhesive used presented acetone as solvent, but the values of adhesive resistance to the dentin return to the values of the teeth not submitted to whitening in one week. The same bleaching technique did not alter the adhesive resistance to the dentin of the adhesive system that presents water and ethanol as solvent and for the self-etching adhesive system [39].

One year after in this study, a new *in vitro* study carried out to evaluate the adhesiveness of enamel composites after dental bleaching using 35% hydrogen peroxide and 37% carbamide peroxide, and demonstrated that the use of both bleaching gels causes reduction of adhesiveness [40]. However, the elements clarified with 37% carbamide peroxide recover the adhesion capacity more quickly and it would be feasible for dental surgeons to wait 48 hours to work safely regardless of the technique and material used. The waiting time of only 24 hours for accomplishment of adhesive restorative procedures has its adhesiveness compromised [41], more studies to clarify the controversies about the subject [42].

Clinical evaluation

The Visual scale and photos commonly used in the dental office to evaluate the color of the teeth for aesthetic procedures; this subjective form requires greater care, ranging from ambient illumination to operator training to minimize discordance. A form considered objective because it is less subject to variations achieved through a spectrophotometer, simple to use and with high precision [10], but not used in the daily routine of the clinician.

The offices usually have more than one source of light whether it is incandescent, fluorescent or natural, these cause differences in the color rendering by the visual mode, in addition to that the hygiene of the mouth must be made in advance for better condition of choice [43].

The evaluations from time to time are important to determine the longevity of bleaching. However, the literature does not find work with a long-term follow-up of patients, which makes it difficult to obtain data to prove and guide its use [44]. All these conditions are of paramount importance for the correct independent clinical evaluation of the whitening agent, the technique employed.

Clinical research report

This study compared clinically the efficiency of two systems of whitening in the office, being a Hydrogen peroxide 35% and the other peroxide of Carbamide 37%. The application was done with the two bleaching agents in the same patient dividing the application in hemi arc for immediate clinical verification, after 7 days and after 5 months regarding the whitening power and the best visible result.

This study was performed at the dentistry clinic of the Centro Universitário do Norte Paulista of São José do Rio Preto

(UNORP), in two patients, one with 23 years old and the other with 30 years old, siblings, both male, who found their teeth yellowish which bothered them a lot. In the anamnesis it was not reported by both patients, the exaggerated consumption of teas, coffees and affirmed that they were not smokers, did not report prolonged use of antibiotics, traumas and had no dental sensitivity.

After detailed anamnesis, clinical examination of the oral cavity carried out, in which complete health of soft tissues, vitality teeth, absence of carious lesions and few restorations. A form with identification (name, sex and age), treatment to be performed and signing of free and informed consent of both patients were completed.

Patients were advised about the proposed research and post-treatment care, such as diets and beverages containing dyes and in case of possible reports of sensitivity, the volunteers were separated for this study in patient A and patient B.

The dental arches molded with Hydrogum 5 (Zhermack), to obtain gypsum models for the preparation of individual 1 mm thick acetates, to complement with supervised bleaching to normalize the color of the arches after the bleaching in the office, in case there are differences between the arches. These trays tested for adaptations, soft tissue, and hard tissue relationships of both patients.

The whitened elements were of 2nd premolar right to the 2nd left premolar of both arches, divided into hemi-arches. For this, prophylaxis with pumice stone and water, with rubber cup and Robinson brush in all the elements, performed to remove the film acquired in the dental enamel. The labial retractor (Arcflex-FGM) continued the soft tissue protection and lip protection was applied to the base of triamcinolone acetonide.

Teeth coloring performed using the Vitapan Classical color scale where colors A 3,5 were selected for patient A (**Figure 1**) and A2 for patient B (**Figure 2**), digital photographs were taken for initial registration and then to compare the color of the teeth at the end of the bleaching treatment. For the sake of patient safety, the gingival barrier applied with TOP DAM to protect the gingival tissues and the papillae, with relative insulation with cotton rollers, keeping the teeth and tissues always dry so that there is no failure in the proposed technique.

The office bleaching was performed with the bleaching agents 35% hydrogen peroxide and 37% carbamide peroxide, applied with the same technique, for this the patients' dental arches were divided in half with the placement of a polyester strip between the proximal ones central incisors to divide hemiarchs to start the bleaching technique (**Figure 3**). The right and left quadrants then given the corresponding whitening gel.



Figure 1 Teeth coloring performed using the vitapan classical color scale.



Figure 2 Color of the teeth at the end of the bleaching treatment.



Figure 3 Bleaching technique.

The peroxide gel handled according to the manufacturer's recommendations (3 drops of peroxide to 1 thickener), handling until homogeneous. The hydrogen peroxide gel at 35% - Whiteness HP was applied with the aid of a plastic spatula applied in the upper and lower right hemispheres. The 37% carbamide peroxide (Office Power bleaching 37% -BM4) in the upper and lower left hemiarco, both at the same time. After 15 minutes, the products aspirated with the aid of a disposable surgical sucker and the gel re-applied according to the recommendations of the manufacturer of the product.

Three applications were performed for 15 minutes, totaling 45 minutes.

After 45 minutes the gel removed by suction and gauze, the dental surfaces cleaned with dry cotton rollers and then rinsed with water/air spray. The gingival barrier removed with a scavenger probe, as well as the retractor. The colors registered shortly after the completion of the whitening agent (**Figures 4 and 5**).



Figure 4 Dental surfaces after the treatment.



Figure 5 Buccal aspects of the teeth.

After the procedure, patients A and B given the 16% carbamide peroxide based syringes and their previously made trays given a small drop of the product in the region of the tray corresponding to the buccal aspect of the teeth. Indicated the use of the bleaching product for 2 hours, during 30 days during the daytime period.

Results

The patients' age range was 23 and 30 years, therefore, older patients could present possible interferences due to the physiological alterations of the dental tissues as the largest deposition of reactive dentin. With regard to sensitivity, **Table 1** shows that patients did not report sensitivity (0%) when using 37% Carbamide peroxide and 35% hydrogen peroxide. However, moderate sensitivity (100%) has been reported in

patients using the 16% carbamide peroxide gel in the supervised home technique.

Table 1 Evaluation of the level of sensitivity by the substances.

Substances	Patient A	Patient B
Hydrogen Peroxide 35%	—	—
Carbamide Peroxide 37%	—	—
Carbamide Peroxide 16%	1	1

Regarding sensitivity, regarding whitening techniques (supervised or clinic), it is observed in **Figure 6** that the sensitivity was higher in the supervised technique (100%).

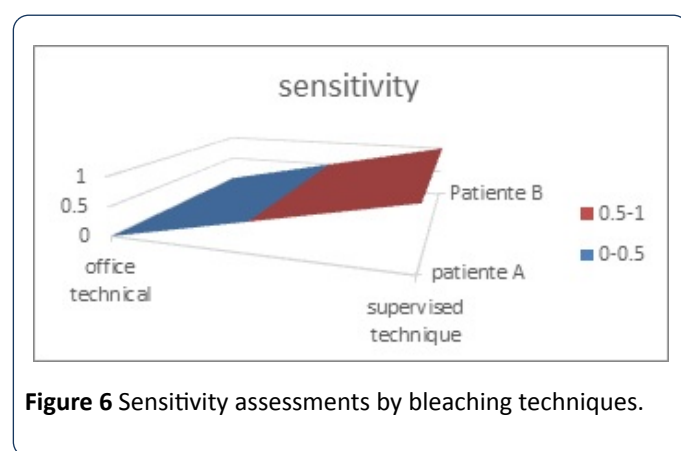


Figure 6 Sensitivity assessments by bleaching techniques.

The color change was noted that there was no visible difference in the result obtained with hydrogen peroxide at 35% and carbamide peroxide at 37%, because if there was a decrease in the color scale of 1 to 3 shades, as illustrated in **Table 2**. As for the techniques, the office obtained the best result, since it managed to descend from 1 to 3 shades, in only one session while the supervised one kept the tones reached previously. There was no recurrence of color in reassessed patients.

Table 2 Evaluation of the change of tonality through the scores.

Substance	Patient N %	Score		Reduction of Tonality
		Initial	Finale	
Hydrogen Peroxide 35%	A	3.5	1	2.5
	B	2	1	1
Carbamide Peroxide 37%	A	3.5	1	2.5
	B	2	1	1
Carbamide Peroxide 16%	A	1	1	0
	B	1	1	0

Satisfaction was achieved in 100% of the patients, a very significant level. With greater emphasis on the office

technique, there was no difference in satisfaction with the supervised one.

Discussion

There is a great deal of research on the topic of tooth whitening, but there is no similarity between the applied methodologies, which makes it difficult to compare different studies. In 2010, the researchers showed the greater effectiveness in the alteration of color in bleaching with the gel peroxide of hydrogen when compared with the carbamide [1].

However, when comparing the effects between the techniques of whitening used in the office and performed by the home technique, it was determined that both the technique in the office was more satisfactory than the home technique. However, after 14 days the techniques in question shown to be equivalent [45].

Based on these and other researches [46-48], it was proposed to investigate which clinic bleaching gel would be most effective clinically and in the eyes of the patient.

According to Nathoo et al. and Xavier et al. higher concentrations are able to clear more, confirming with the findings of this research. However, contrary to the results presented in this study, Dietschi et al. in their research, have highlighted the achievement of more significant results with the use of bleaching agents for domestic use, in the form of gels applied with the aid of when compared to the results obtained by the application of the photoactivated bleaching gels.

Simões emphasizes that the use of hydrogen peroxide in home bleaching achieves effective bleaching faster than carbamide peroxide, with equivalent proportions. This assertion is due to the fact that carbamide peroxide decomposes into hydrogen peroxide to be effective. However, in this work, P. carbamide was used 16% for a period of 4 weeks and an effective stabilization of the bleaching result of which can be observed in **Table 2**. Confirming the results of the present study, Ghassan et al. and Delfino et al. in their studies found that carbamide peroxide achieved a greater reduction of color than hydrogen peroxide in the same proportions and in the home technique. This fact can occur because carbamide peroxide produces urea which can still be decomposed into carbon dioxide and ammonia. High ammonia pH facilitates the bleaching procedure.

Any bleaching treatment tends to recur, so the procedure may require an additional visit. Although the results found in this research deny this fact, it is believed that with an evaluation for a longer period of time this may become a reality.

Patient satisfaction is very important, since the aesthetic appearance has influence in social life, work environment and mental health. Changes in the colors of the teeth are easily perceived causing enormous dissatisfaction to the patient. The satisfaction was achieved with the office technique and in higher values for the stabilization and maintenance of the color by the supervised technique. Confirming the findings of

this research, Caballero et al. in their study, achieved satisfaction of the patients with the homemade technique.

Changes in the smile show admirable effects on people's self-esteem, especially in an extremely competitive society where the standard of beauty is so heavily ingrained by the current media, and certainly this pattern is tied to new perspectives.

The self-esteem of these boys improved with dental bleaching by 80%, thus confirming the importance of a beautiful smile for the individual's well-being, yet not enough for a high esteem.

It was found that the use of bleaching agents promotes a change in the color of the teeth, the degree of whitening being dependent on the technique used and the concentration of the chemical bleaching agents used. In this way, special care by the professionals, in the closing of the diagnosis, correct indication of the best technique and material that will be used.

Conclusion

Based on the results obtained, it can be concluded that:

1. Both techniques and substances are effective.
2. The office technique did not show sensitivity in 100% of the cases.
3. The supervised technique presented mild sensitivity in 100% of the cases.
4. The technique of surgery was that it presented greater color change, independent of the substance used, both P. Hydrogen 35% and Carbamide Peroxide 37%.
5. The technique that showed the highest percentage of patient satisfaction was in the office.
6. All materials used contribute to the improvement of patients' self-esteem.

References

1. Santos RPM, Souza CS, Santana MLA (2010) Comparison between dental whitening techniques and evaluation of the substances carbamide peroxide and hydrogen. *UNITAU* 2: 24-33.
2. Araujo DB, Lima MJP, Araujo RPC (2007) Action of bleaching agents containing hydrogen peroxide and carbamide peroxide on human dental enamel. *Rev Ci Méd Biol* 6: 100-121.
3. Tin-Oo MM, Saddki N, Hassan N (2011) Factors influencing patient satisfaction with dental appearance and treatments they desire to improve aesthetics. *BMC Oral Health* 11: 6.
4. Kokich VO, Kokich VG, Kiyak HA (2006) Perceptions of dental professionals and laypersons to altered dental esthetics: asymmetric and symmetric situations. *Am J Orthod Dentofacial Orthop* 130: 141-151.
5. Qualtrough AJ, Burke FJ (1994) A look at dental esthetics. *Quintessence Int* 25: 7-14.
6. Rodrigues JRSA, Lund RG, Moura FRR, Demarco FF (2002) Home dental bleaching in dentistry with minimal intervention. *JBD Curitiba* 1: 194-200.
7. Lee BS, Huang LC, Hong CY, Wang SG, Hsu WH, et al. (2011) Synthesis of metal ion-histidine complex functionalized mesoporous silica nanocatalysts for enhanced light-free tooth bleaching. *Acta Biomater* 7: 2276-2284.
8. Sulieman M (2005) An overview of tooth discoloration: extrinsic, intrinsic and internalized stains. *Dent Update* 32: 463-471.
9. Cervantes A, Bolanho A, Valera MC, Araujo MAM (2006) Study of the microhardness of the bovine enamel submitted to the bleaching treatment activated by different light sources. *Br Dent Sci* 9: 78-86.
10. Bernardon JK, Sartori N, Ballarin A, Perdigo J, Lopes GC, et al. (2010) Clinical performance of vital bleaching techniques. *Oper Dent* 35: 3-10.
11. Pasquall EL, Bertazzo CA, Anziliero L (2014) Study of clarity effects dental about the enamel: a review from evidence to indication clinic. *Perspectiva Erechim* 38: 99-108.
12. Silva FMM, Nacano LG, Pizi ECG (2012) Clinical evaluation of two tooth whitening systems. *Rev Odonto Bras Central* 21: 473-479.
13. Guth RC, Filho AAC, Castro SL, Gagliardi RM (2012) Dental whitening of dental surgery with whiteness hp blue 20% and whiteness hp maxx 35% - clinical case report. *Dentistry* 11: 33-37.
14. Minoux M, Sertaty R (2008) Vital tooth bleaching biologic adverse effects-A review. *Quintessence Int* 39: 645-659.
15. Zanin F (2010) Vital teeth whitening using light. *Ver Assoc Paul Cir Dent* 64: 7.
16. Pinheiro HB, Costa KG, Klautau EB, Cardoso PE (2011) Microstructural analysis of enamel treated with hydrogen peroxide and carbamide. *Gaucha Dentistry J* 59: 215-220.
17. Brasilino MS (2014) Mechanism of action of hydrogen peroxide on tooth whitening: a literature review. *UNESP*. pp: 1-40.
18. Vierira AC, Dourado VC, Santos LCS, Oliveira MCS, Silva ISN, et al. (2015) Adverse reactions of glazing of vital teeth. *Odontol Clin Scientific (Online)* 14: 809-812.
19. Cunha CM (2004) Effect of hydrogen peroxide at 35% on bond strength of different adhesive systems to dental enamel at different time periods after bleaching.
20. Nascimento MRA, Toneli MVA (2001) Evaluation of human dental enamel submitted to the bleaching treatment with carbamide peroxide at 35% using laser auro and halogen light, by scanning electron microscopy [Monograph]. São José dos Campos: Faculty of Dentistry, University of Vale do Paraiba.
21. Pinto CF, Oliveira R, Cavalli V, Giannini M (2004) Peroxide bleaching agent effects on enamel surface microhardness, roughness and morphology. *Braz Oral Res* 18: 306-311.
22. Silva MFA, Davies RM, Stewart B, Devizio W, Tonholo J, et al. (2006) Effect of whitening gels on the surface roughness of restorative materials in situ. *Dent Materials* 22: 919-924.
23. Miranda CB, Pagani C, Benetti AR, Matuda FS (2005) Evaluation of the bleached human enamel by scanning electronic microscopy. *J Appl Oral Sci* 13: 204-211.
24. Al Shethri S, Matis BA, Cochran MA, Zekonis R, Stropes MA (2003) Clinical evaluation of two in-office-bleaching products. *Oper Dent* 28: 488-495.
25. Nunes MF, Masotti AS, Rolla JN, Soares CG, Conceição EN (2009) Evaluation of the effect of two dental whitening techniques in the office using hydrogen peroxide. *Rev Fac Odontol* 50: 8-11.

26. Firat E, Ercan E, Gurgan S, Cakir FY, Berker E (2011) The effect of bleaching systems on the gingiva and the levels of IL-1 β and IL-10 in gingival crevicular fluid. *Oper Dent* 36: 572-580.
27. Khoroushi M, Mazaheri H, Manoocheri A (2011) Effect of CPP-ACP application on flexural strength of bleached enamel and dentin complex. *Oper Dent* 36: 372-379.
28. Sharma DS, Sharma S, Natu SM, Chandra S (2011) Na in vivo evaluation of radicular penetration of hydrogen peroxide from bleaching agents during intra-coronal tooth bleaching with an insight of biologic response. *J Clin Pediatr Dent* 35: 289-294.
29. Smidt A, Feuerstein O, Topel M (2011) Mechanical, morphologic and chemical effects of carbamide peroxide bleaching agents on human enamel in situ. *Quintessence Int* 42: 407-412.
30. Meireless SS, Goettems ML, Dantas RV, Bona AD, Santos IS, et al. (2014) Changes in oral health related quality of life after dental bleaching in a double-blind randomized clinical trial. *J Dent* 42: 114-121.
31. Do Amaral FL, Sasaki RT, da Silva TC, França FM, Flório FM, et al. (2012) The effects of home-use and in-office bleaching treatments on calcium and phosphorus concentrations in tooth enamel: na in vivo study. *J Am Dent Assoc* 143: 580-586.
32. Reis A, Tay L, Herrera D, Kossatz S, Loguercio A (2011) Clinical effects of Prolonged Application Time of na In-Office Bleaching Gel. *Oper Dent* 36: 590-596.
33. Sa Y, Sun L, Wang Z, Liang S, Xing W, et al. (2013) Effects of two in office bleaching agents with different pH on the structure of human enamel: an in situ and in vitro study. *Oper Dent* 38: 100-110.
34. Campos ICM, Gomes GM, Pupo YM, Bittencourt BF, Baggio R, et al. (2011) Effect of different bleaching agents on the surface roughness of composite resins. *Odontol Clin Cient* 10: 271-276.
35. Varanda E, Do Prado M, Simao RA, Dias KR (2013) Effect of in-office bleaching agents on the surface roughness and morphology of different dental composites: na AFM study. *Microsc Res Tech* 76: 481-485.
36. Portolani Junior, Candido MV, Machado MS (2005) Effect of bleaching agents on dental structures. *J Dentistry* 34: 91-94.
37. Haywood VB, Leonard RH, Nelson CF, Brunson WD (1994) Effectiveness, side effects and long-term status of night guard vital bleaching. *J Am Dent Assoc* 125: 1219-1226.
38. Moncada G, Sepulveda D, Elphick K, Contente M, Estay J, et al. (2013) Effects of light activation, agent concentration, and tooth thickness on dental sensitivity after bleaching. *Oper Dent* 38: 467-476.
39. Legramandi DB (2005) Adhesive resistance to dentin after tooth whitening.
40. Borges GA, Pereira GA, Martinelli J, Oliveira WJ (2006) The influence of dental bleaching on the bond strength at the resin-enamel interface. *Robrac* 15: 40.
41. Marson FC (2008) Effect of tooth whitening on the adhesive strength of enamel. *RGO* 56: 33-37.
42. Pegoraro CACC, Oliveira NA, Diniz LSM, Svizero NR, Alpino PHP (2011) Influence of bleaching agents on the adhesive resistance of composite restorations to dental tissues: current moment. *Dentística Magazine* 20: 11-18.
43. Watts A, Addy M (2001) Tooth discolouration and staining: a review of the literature. *Br Dent J* 190: 309-316.
44. Carey CM (2014) Tooth whitening: what we now know. *J Evid Based Dent Pract* 14: 70-76.
45. Siqueira MR, Rezende E, Calixto AL, Kossatz S (2011) Associating office whitening with homemaker to increase longevity - case report. *Full Dent Sci* 2: 305-312.
46. Matis BA, Cochran MA, Eckert G (2009) Review of the effectiveness of various tooth whitening systems. *Oper Dent* 34: 230-235.
47. Mondelli RF, Azevedo JF, Francisconi AC, Almeida CM, Ishikiriama SK (2012) Comparative clinical study of the effectiveness of different dental bleaching methods - two year follow-up. *J Appl Oral Sci* 20: 435-443.
48. Barbosa DC, De'Stefani TP, Ceretta LB, Ceretta RA, Simoes PW, et al. (2015) Comparative study between the techniques of dental whitening in the office and supervised home dental whitening in vital teeth: a literature review. *Rev Odontol Univ Cid Sao Paulo* 27: 244-252.