EFFECTIVENESS OF VARIOUS DENTAL BLEACHING TECHNIQUES- AN IN VITRO STUDY

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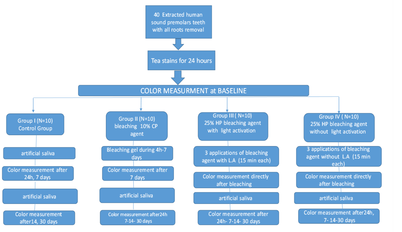
Introduction

Stained or discolored teeth make it troublesome for a person to look and feel good. Bleaching is a conservative and efficacious practice in dentistry to whiten discolored and stained teeth. At present, home bleaching (10% Carbamide peroxide) and in-office bleaching (25% H_2O_2) can be served with a number of available whitening methods.

Various light sources have been used for activation of bleaching agents in power bleaching. However, the effect of light energy source in activation of bleaching gel remains unclear.

Aim of the study

Hence, this study aimed to evaluate the efficacy of home bleaching agent (10% Carbamide Peroxide) and in-office bleaching agent (25% hydrogen peroxide) with and without light activation.



Statistical analysis

Color change related to time was measured using repeated-measures ANOVA. One-way ANOVA with post hoc Tukey's multiple comparison tests.

Materials and methods

Ethical Approval

Ethical approval was obtained from the research center of Riyadh Elm University. Study was registered with number FPGRP/43430006/128.

Study design

It was a lab based study that compared the effectiveness of (10%) Carbamide Peroxide bleaching agent and (25%) hydrogen peroxide bleaching agent with light activation by Zoom In Office Light Activator (LED-Philips Zoom, Discus Dental, Inc. USA, 400-505 nm (violet color)) and without light activation.

Specimen teeth collection

Sixty (60) human sound premolars teeth extracted for orthodontic purposes in Riyadh Elm University Hospitals were collected and (40) of them were used in the experiment.

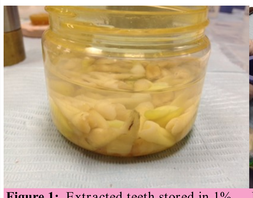


Figure 1: Extracted teeth stored in 1% Thymol solution

Figure 2: Roots cut and embedded in orthoresin

Figure 3: Immersion of sample crown in orthoresin block

Figure 4: Sample after complete setting of orthoresin ready for bleaching

Figure 5: Samples randomly divided into four groups

Figure 6: Coding and grouping of samples in separate containers

Stain development

Figure 7: Direct staining of crowns by using a standardized tea solution

Color measurement

Color measurements were based on the Commission Internationale de l'Eclairage L*a*b* mode. In this mode, the L* represents the light value (brightness), the a* represents either green (- a*) or red (+ a*), and the b* represents either blue (- b*) or yellow (+ b*). The difference between the color coordinates was calculated as

$$\Delta E = \{(\Delta L^*)2 + (\Delta a^*)2 + (\Delta b^*)2\}1/2$$

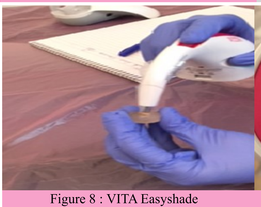


Figure 8 : VITA Easyshade

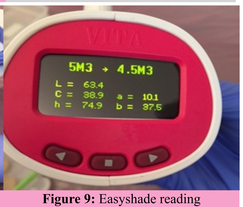


Figure 9: Easyshade reading

Sample groups

Figure 10: (G1)Samples of control group in artificial saliva

Figure 11: (G2) Group samples' subjected to 10% CP bleaching agent.

Figure 12: (G3) 25% HP bleaching agent with light activation.

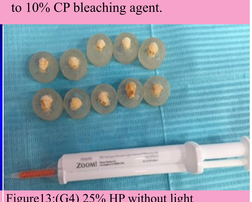
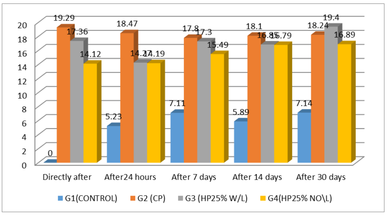


Figure13:(G4) 25% HP without light activation

Results

GROUPS / PERIODS	Direct After bleaching	24 hours after bleaching	7 days After bleaching	14 days After bleaching	30 days after bleaching
CONTROL. No bleaching	-	5.23 (2.85)	7.11 (3.88)	5.89 (3.35)	7.14 (3.24)
10% Carbamide Peroxide.	19.29 (6.67)	18.47 (7.70)	17.80 (6.17)	18.10 (6.04)	18.24 (5.55)
25% Hydrogen peroxide with light activation	17.36 (4.02)	14.27 (3.88)	17.30 (2.69)	16.85 (3.01)	19.41 (4.11)
25% Hydrogen peroxide without light activation	14.12 (3.86	14.19 (4.63)	15.49 (4.87)	16.79 (6.09)	16.89 (6.09)

Mean of ΔE values and Standard Deviations (SD) for all groups at each evaluation period



Mean of ΔE values at different time intervals

Table 6: Mean of ΔE values, Standard Deviations (SD) and *P.* values of all evaluation periods

GROUPS / PERIODS	Direct After bleaching	24 hours after bleaching	7 days after bleaching	14 days after bleaching	30 days after bleaching
*G1	-	5.23(2.85)	7.11(3.88)	5.89(3.35)	**7.14(3.24)**
**G2	19.29(6.67)	18.47(7.70)	17.80(6.17)	18.10(6.04)	**18.24(5.55)**
*P.	-	**.000**	**.000**	**.000**	.000
*G1	-	5.23(2.85)	7.11(3.88)	5.89(3.35)	**7.14(3.24)**
***G3	17.36(4.02)	14.27(3.88)	17.30(2.69)	16.85(3.01)	**19.41(4.11)**
*P.	-	**.002**	**.000**	**.000**	.000
*G1	-	5.23(2.85)	7.11(3.88)	5.89(3.35)	**7.14(3.24)**
****G4	14.12(3.86)	14.19(4.63)	15.49(4.87)	16.79(6.09)	**16.89(6.09)**
*P.	-	**.002**	**.001**	**.000**	.000
**G2	19.29(6.67)	18.47(7.70)	17.80(6.17)	18.10(6.04)	**18.24(5.55)**
***G3	17.36(4.02)	14.27(3.88)	17.30(2.69)	16.85(3.01)	**19.41(4.11)**
*P.	1.000	.442	1.000	1.000	**1.000**
**G2	19.29(6.67)	18.47(7.70)	17.80(6.17)	18.10(6.04)	**18.24(5.55)**
****G4	14.12(3.86)	14.19(4.63)	15.49(4.87)	16.79(6.09)	**16.89(6.09)**
*P.	.070	. 412	1.000	1.000	**1.000**
***G3	17.36(4.02)	14.27(3.88)	17.30(2.69)	16.85(3.01)	**19.41(4.11)**
****G4	14.12(3.86)	14.19(4.63)	15.94(4.87)	16.79(6.09)	**16.89(6.09)**
*P.	.629	1.000	1.000	1.000	**1.000**

***G1 (none bleaching group), **G2 (bleaching by 10% Carbamide Peroxide)**
*****G3 (bleaching by 25% HP with light activation (LED \ZOOM)**
******G4 (bleaching by 25% HP without light activation).**

Discussion and Conclusions

In this study, the degree of bleaching obtained via the in-office technique (25% HP, three applications for 15 minutes each) was similar to that obtained by the home bleaching technique (10% CP/4 hours/7 days) regardless of the use of a light source.

This result is in line with the findings of Sulieman et al (2005), and contradictory to the Zekonis et al (2003) and Auschill et al (2005).

ΔE values did not differ significantly between in-office bleaching technique using light activation and use of bleaching gel without light activation. This finding is similar to that reported by by Kugel et al (2006), in which in-office tooth whitening with light activation did not exhibit benefit over the chemically activated tooth whitening system after a 2-weeks.

Similar finding was reported by Marson et al (2008) hydrogen peroxide did not show improvement with the use of any light sources tested (halogen light, LED, LED/Laser). High concentration HP (25%) is used during in office bleaching, light may not contribute much to the bleaching results.

Our results contradict with findings of Browning and Swift (2011), Dominguez et al (2011) that demonstrated the efficacy of the association of light sources with in office bleaching systems.

Within the limitations of this study, it can be concluded that using (25%) hydrogen peroxide bleaching agent (irrespective of using light activation) gave same effects as the prolonged application of (10%) Carbamide Peroxide bleaching agent. However, optimal bleaching can be achieved with any techniques used in this experiment.

Recommendations

. Light activation is not required during bleaching
. Similar studies with different bleaching materials are required
. Further clinical trials needed to measure effect of light on the pulp temperature.

References

Auschill TM, Hellwig E, Schmidale S, Sculean A & Arweiler NB (2005) Efficacy, side-effects and patients' acceptance of different bleaching techniques (OTC, in-office, at-home) *Operative Dentistry* 302,156-163.

Dominguez A, Garcia JA, Costela A, Gomez C (2011). Influence of the light source and bleaching gel on the efficacy of the tooth whitening process. *Photomed Laser Surg* 29,53-59.

Kugel G, Papathanasiou A, Williams AJr, Anderson C, Ferreira S (2006). Clinical evaluation of chemical and light-activated tooth whitening systems. *Compend Contin Educ Dent* 27,54-62.

Marson FC, Sensi LG, Vieira LCC, Araújo E (2008). Clinical evaluation of in-office dental bleaching treatments with and without the use of light activation sources. *Oper Dent* 33,5-22.

Sulieman M, Addy M, Macdonald E, Rees JS. (2005). The bleaching depth of a 35% hydrogen peroxide based in-office product: A study in vitro. *J Dent*; 33:33-40.

Browning WD, Swift EJJ (2011). Critical appraisal. Power bleaching. *J Esthet Restor Dent* 23,61-67.

Zekonis R, Matis BA, Cochran MA, Al Shethri SE, Eckert GJ & Carlson TJ (2003) Clinical evaluation of in-office and athome bleaching treatments *Operative Dentistry* 282,114-121.