



Effect of Herbal Matching and its Exposure During Consulting Clarity - *In Vitro* Test

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Received date: 03 August, 2022, Manuscript No. DHCR-22-001;

Editor assigned date: 0 August, 2022, PreQC No. DHCR-22-001(PQ);

Reviewed date: 08 August, 2022, QC No. DHCR-22-001;

Revised date: 15 August, 2022, Manuscript No. DHCR-22-001(R);

Published date: 26 August, 2022, DOI: 10.4172/2329-9533.1000232.

Abstract

Tooth bleaching is one of the most widely used cosmetic procedures. Thus, researches are being conducted to evaluate the effect of some products with dyes during bleaching. To evaluate whether the mate discolored and exposure of natural tooth during bleaching with hydrogen peroxide 35% interferes with the final result of the treatment. Made 32 bovine tooth blocks, divided into groups, GHG (darkened group and immersed in yerba mate during bleaching), GE (darkened and lightened Group), GC (bleached Group) GCE (bleached group and immersed in yerba mate during bleaching). The initial color was analyzed by CIELab method. Then two experimental groups underwent browning being immersed in yerba mate infusion for 15 days, changing the solution daily.

After pigmentation, they underwent new color analysis with spectrophotometer. The groups were bleached in office bleaching technique in two 50 minute sessions with 7 days interval, two groups simulating mate consumption daily by 30 minute. While the two others groups have been subjected to bleaching procedure. After treatment, the specimens were subjected to color analysis. The color measurements were analyzed with statistical test under analysis variance ANOVA and Tukey test. ΔE was difference between the GE and GCE groups ($P=0.016$); ΔL showed no statistical differences ($P=0.152$) showed Δa GHG different from the others ($P=0.005$), Δb GCE showed differences with other groups ($P<0.001$). This research has shown that yerba mate does not negatively influence the bleaching treatment.

Keywords: Dental bleaching; Hydrogen peroxide; Pigments diet.

Introduction

Dental aesthetics are of fundamental importance in social life in the era we are in. Patients are increasingly strict about their smile, which, in addition to being well-aligned, demands that they be increasingly white Menezes et al. [1]. Teeth whitening is a good treatment option

for pulped and pulped, stained or darkened teeth. Because it is not invasive, has low cost and has satisfactory aesthetic results Sampaio et al. [2].

Individuals have habits that can change the color of their teeth, for example, the ingestion of substances with dyes, such as coffee, tea, red wine, mate, cola drinks, beets, tobacco, the use of cationic agents, such as chlorhexidine or metal salts, such as iron and tin, and even the accumulation of bacterial plaque Meireles et al. [3-5]. The staining resulting from the consumption of these substances is called extrinsic, being acquired by contact with the environment after the tooth eruption Téó et al. [6]. Since the intrinsic spots are acquired or congenital origin, generally related to tooth formation and type of staining has a minus f prognosis avorável dental bleaching Teo et al.

A condition that makes extrinsic staining feasible is the habit of drinking chimarrão, which is an infusion of hot water made with the dried and chopped leaves of *Ilex paraguariensis*, a drink much appreciated for its peculiar flavor, stimulating properties and caffeine content, theobromine and flavonoids. This custom is maintained for centuries on a large scale in the countries of South America Jotz et al.

When the patient's complaint is a change in the color of their teeth, the dental surgeon must make a good anamnesis, assessing the etiology and composition of the changes in the color of the teeth in order to obtain a correct diagnosis and success in the treatment Zanin et al. [7,8].

The products used in bleaching techniques may contain hydrogen peroxide, carbamide peroxide, sodium perborate and hydroxylite in their composition. As the perborate sodium use a predominant agent in the treatment of non-vital teeth. Whiteners that have hydroxylite as a component are used in order to reduce tooth sensitivity. Carbamide peroxide in concentrations ranging from 10% to 22% is the most used in the home-made whitening technique Penha et al. in a concentration of 35% is used in the office and hydrogen peroxide is the substance used in the office technique in concentrations ranging between 15% and 40% Alqahtani.

It is believed that a diet where there is frequent consumption of foods with a high content of pigments can directly influence the maintenance of the whitening treatment. And that the absorption of stains by the enamel is related to the pH, composition, exposure time and temperature of these agents Attin et al. [11-13]. Some manufacturers ask patients to maintain a white diet for the duration of the procedure. However, *in vitro* studies concluded that the ingestion of food with dyes during tooth whitening and over time does not interfere with the results obtained with tooth whitening Attin et al. [11,14,3].

Although the subject of tooth whitening is widely studied by researchers, there are still disagreements in the literature about food restriction and how much it can affect during treatment and the longevity of the result. Therefore, it is interesting that further studies are conducted to better understand which foods with staining properties influence the treatment outcome.

Objective

To evaluate whether the consumption of chimarrão during treatment with a commercially available hydrogen peroxide bleaching agent

(Whiteness HP Automixx-FGM) in the office technique influences the final result of the procedure.

Materials and Method

32 bovine incisors were used in the present study, stored in containers containing saline. Each sample was cleaned with periodontal cures and prophylaxis using a Robinson brush (Microdont, São Paulo, SP-Br), pumice (SS White, Rio de Janeiro, RJ-Br) and water for 40 seconds under manual pressure with a counter-low speed angle. They were longitudinally sectioned in the middle third of the crown of the teeth with double-sided diamond discs (KG Sorensen, Barueri, SP-Br), the fragments were left with 8x8 millimeters (mm) and the thickness standardized using a digital caliper (Digimess 100.179C, São Paulo, SP-Br), checking at five different points on the surface of the same fragment. These were selected using as a standard the absence of cracks, excessive wear of the incisal third, morphological changes in the crown and stains.

The faces of the fragments that did not have enamel were sealed with colorless Impala nail polish (Treatment, Guarulhos, SP-Br) so that the dentin was not exposed, preventing the dye from penetrating the dentin through these parts, considered more permeable. After isolation, the specimens were placed in a container containing saline until immersion in hot water and mate herb infusion. The teeth were randomly divided into four groups (n=8) Group darkened and immersed in yerba mate during whitening (GHG), Group darkened and whitened (GE), Group whitened and immersed in yerba mate during whitening (GCE), Whitened group (GC).

Their initial color was initially analyzed with a CM-2600d/2500d spectrophotometer (Konica Minolta, Tokyo, Japan) using the CIELab method, with three readings using the CIELab system parameters (L* indicates luminosity, a* represents color and saturation on the red-green axis and b* means color and saturation on the yellow-blue axis), established in 1967 by the international lighting commission.

The GEE and GE groups were immersed in 200 ml of heated distilled water (corresponding to the sizzle of the kettle) and 4 g of

yerba mate (terra mate, cascavel, PR-Br) for a period of 15 days, this solution being changed every 24 h to cause browning. After pigmentation, the teeth were washed in an ultrasonic vat (digital ultrasonic cleaner - gnatus, baretos, SP-Br) for 5 minutes to remove debris, after which they were submitted to a new color analysis with a spectrophotometer.

The four groups were whitened in the office whitening technique with the product: whitening gel (Whiteness HP Automixx-FGM, Joinville, SC-Br) in two 50 minute sessions with an interval of seven days. Since the GHG and GCE groups were immersed daily in the infusion of yerba mate for 30 minutes during the interval between whitening sessions, simulating a daily consumption, then prophylaxis with Robinson pumice brush and water was performed during the seven days.

After the two applications of the bleaching gel, the specimens were subjected to a new color analysis using the CIELab method. The color difference (ΔE) between the first and the second reading was calculated according to the equation: $L^* f, a^* f, b^* f =$ values of the initial readings after the pigmentation protocol; $\Delta E = [(L^* f - L^* i)^2 + (a^* f - a^* i)^2 + (b^* f - b^* i)^2]^{1/2}$ L* i, a* i, b* i = values of readings immediately after lightening. The values obtained in the readings before and after pigmentation were subjected to analysis of variance (ANOVA) and to the Tukey test with an overall significance level of 5% for differentiation of means.

Results

The Tukey test (0.05%) was performed comparing the ΔE , ΔL , Δa , Δb , to analyze which of the treatments was more effective between the groups.

And according to the results described in Table 1, ΔE showed better results in SG compared to the GCE. ΔL no statistically significant differences were observed. Regarding Δa , the GHG group was better than the GE, GCE, and GC groups. As for Δb , the CG group was inferior to the other groups.

Treatment	Color analysis	Average values
Group (GHG)	ΔE	10.33 ± 2.13 AB
	ΔL	9.22 ± -8.02 C
	Δa	0.65 ± -1.18 D
	Δb	8.36 ± -1.81 F
Group (GE)	ΔE	9.71 ± 2.46 A
	ΔL	8.63 ± -9.67 C
	Δa	0.55 ± -2.53 E
	Δb	5.7 ± -3.61 F
Group (GCE)	ΔE	3.93 ± 1.87 B
	ΔL	3.9 ± -3.15 C
	Δa	-0.15 ± -1.33 E
	Δb	0, -2.4 L ± 06

Group (GC)	ΔE	14.05 ± 2.90 A
	ΔL	13.31 ± 5.11 C
	Δa	-0.28 ± 1.16 E
	Δb	-1.79 ± 5.9 H

Table 1. Statistical analysis of color variables after completion of treatment. The same capital letters inserted in (Average of values) show different results, but statistically insignificant.

- Δ And the GE group compared to the GCE had (P=0.016) showing a statistical difference between the two treatments.
- ΔL there were no statistical differences with (P=0.152).
- Δ a, statistical difference was (P<0.005) comparing the GHG group with the GE, GCE, GC.
- Δb (P=<0.001) when comparing the GHG group with the CG the GE with the GC and the GCE with the GC.

Discussion

This research aimed to evaluate the yerba mate intake in the form of infusion, during the treatment with bleaching agent hydrogen peroxide 35% trademark (Whiteness HP Automixx-FGM) by the office of technical influe INSTANCE would in the end result of procedure.

Many researches use bovine teeth to replace human teeth, since it is more accessible to purchase, and its chemical and structural composition is similar to the human dentition Schilke et al. 2000; Wiegand et al. 15]. However, Camargo et al. [16] observed that bovine teeth are significantly less permeable to hydrogen peroxide than human teeth. The chemical and physical properties such as composition, density, enamel diameter, heat resistance and Vicker's hardness are very similar to human enamel and the permeability of bovine dentine dentin is similar to that of human dentin, although there are differences in morphology and thickness for these two species Wiegand et al. Because of the ease in acquiring the teeth and the resemblance to human teeth, the bovine samples were those chosen for use in our research.

Although the mechanism of action of whitening agents is not yet fully understood, it is known that the real bleaching agent is hydrogen peroxide (H₂O₂), being an oxidizing agent that, as it spreads in the tooth, dissociates to produce unstable free radicals which are hydroxyl radicals (HO), perhydroxyl radicals (HOO), perhydroxyl anion (HOO-) and superoxide anion (OO-), which will attack the organic molecules in the regions between inorganic salts those of the dental structure, linking the double bonds of chromophoric molecules within the tissues of MINOUX and SERFATY. The change in the union of the double bond results in smaller and less pigmented components, and there will be a change in the absorption spectrum of chromophoric molecules, followed by teeth whitening. The concentration of hydrogen peroxide has a significant effect on the number of applications necessary to produce the ideal whitening result, which means that whitening with gels and m lower concentrations of pH, requires a greater number of applications Sulieman et al. [18].

The product chosen for the research was the whitening gel (Whiteness HP Automixx-FGM) used in the office technique. Two sessions were held with seven-day intervals, including. Its base is 35% hydrogen peroxide, which comes in the form of a double-body syringe, where the thickener and peroxide are contained in different

compartments. D is pensaing the ssim the manual mixing, as comes with a tip automistura and can be kept in contact with the teeth for up to 50 minutes without the need for exchange, as its pH remains neutral and stable throughout the session [19].

There are often discussions about the adverse effects that whitening can cause. These effects can be systemic, related to ingestion of the whitening gel, or local, which occur on the structure of the dental element and adjacent acids. Among these we can mention dentin sensitivity, changes in the mineral content of the enamel that results in a demineralization process and consequently alter microhardness, surface micromorphology and roughness Bonafé et al [20-23].

Laboratory studies indicate that teeth submitted to bleaching and exposed to dyes of the diet, have greater capacity of staining Berg et al. and the lightening effect seems to be less stable Atiia et al. [24], making dietary restrictions essential for the success of tooth whitening. Although there are studies Meireles et al. that correlated the effectiveness and longevity of tooth whitening with the frequency of ingestion of foods and drinks rich in dyes, a bibliographic research did not reveal clinical studies that correlated the effectiveness and longevity of tooth whitening with the consumption of food and colored drinks during the procedure Rezende et al. [21].

Other *in vitro* studies have concluded that eating foods with dyes during tooth whitening and over time does not interfere with the results obtained with tooth whitening Attin et al., Cardoso et al. 2005, Meireles et al. [11,14,3]. However, care should be taken after bleaching, with color extrinsic to the bleached enamel MATIS et al. [22]

The substance chosen to darken the specimens was the infused yerba mate, and this drink is a habit for the population, not only in Brazil, but also in Argentina, Uruguay and part of Paraguay and Bolivia. Sehnem and Veltrini concluded that a significant percentage of individuals (58%) started consuming chimarrão in childhood, started using it willingly (46%), have been consumers for more than 10 years (74%), ingest mate twice a day (54%), make use of it for less than 30 minutes (54%) and consume in a hot temperature (84%), which corresponds to the sizzling of the kettle. Taking into account that the average daily consumption period of the drink is 30 minutes, in the present study the fragments were immersed in yerba mate for 30 minutes daily.

Color data of the specimens were obtained using the CIELab system (standard commission internationale de l'eclairage color system), which enabled the comparison and statistical analysis of the data. According to this system, the color of the specimens can be expressed in three coordinated values (L * a * b *), which quantify the object in three dimensions with respect to its color. The CIE L * a * b is a three-dimensional color scale, where the L * coordinate indicates variations in brightness, quantities from 0 (black) to 100 (white). The a * and b * axis are the hue, where a * indicates saturation on the red (positive) to green (negative) axis, b * on the yellow (positive) to blue

(negative) axis MATIS et al. 1998 (23). The comparison of the initial color, before and after bleaching was given by the color difference or ΔE , represented by the equation: $\Delta E^* = ((\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2)^{1/2}$.

Through see fiction of the search analysis it was observed that the samples remained in contact with the solution of yerba mate during the clinical protocol of whitening obtained one result more effective than the other teeth. Perhaps because of being in dark are the whitening gel p ô to react with more pigments present and result in an improved bleaching. The ΔE analysis showed a difference, resulting in (P=0.016); mean values between the groups in the axis L * not Showing Faults plow differences are statistically significant s (P=0.152). The data analyzed in Δb had an increase in yellow intensity with a statistical difference of (P =<0.001). The values found in Δa all suffered a trend towards the red axis, this analysis probably occurred due to the immersion in yerba mate causing the excessive pigmentation of green. The bleaching was satisfactory, as it significantly decreased the pigmentation intensity.

Conclusion

In view of the exposed results, it was observed that the group submitted to simulation of the consumption of yerba mate during the office whitening treatment had a whitening effect superior to the other groups.

Resume

Teeth whitening is one of the most widely used aesthetic procedures today. Thus, research is being carried out to evaluate the effect of some products with dyes during bleaching. Evaluate whether the exposure of yerba mate in darkened and natural teeth during bleaching with 35% hydrogen peroxide interferes with the final result of the treatment. Confeccionados 32 blocks of bovine teeth, divided into groups, GHG (Group darkened and immersed in yerba mate during bleaching), GE (Group darkened and lightened), GC (Group cleared), GCE (Group bleached and immersed in worth matt during whitening). The initial color was analyzed using the CIELab method. Then, two groups were subjected to experimental darkening and immersed in yerba mate infusion for 15 days, changing the solution daily. After pigmentation, they were submitted to a new color analysis with a spectrophotometer. The groups were whitened using the office whitening technique in two 50-minute sessions with a 7 day interval, two groups simulating the consumption of chimarrão daily for 30.

While the other two were submitted only to the whitening procedure. After treatment, and specimens were subjected to color analysis. The color measurements performed were analyzed in the statistical test under ANOVA analysis of variance and Tukey test. ΔE had a difference between the GE and GCE groups (P=0.016); ΔL did not show statistical differences (P=0.152), Δb shows u the GHG different from the others (P=0.005), Δa showed differences in GCE with the other groups (P<0.001). The present research showed that yerba mate does not negatively influence the whitening treatment.

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