



**UNIVERSIDADE FEDERAL DE SERGIPE
CENTRO DE CIÊNCIAS BIOLÓGICAS E DA SAÚDE
DEPARTAMENTO DE ODONTOLOGIA**

REBECA RAYANE PEREIRA DE MENEZES

**TOOTH BLEACHING EFFECT ON COLOR ALTERATION
AND TRANSLUCENCY IS SIMILAR IN ENAMEL AND
DENTIN**

ARACAJU - SE

2017

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**TOOTH BLEACHING EFFECT ON COLOR ALTERATION
AND TRANSLUCENCY IS SIMILAR IN ENAMEL AND
DENTIN**

Trabalho de Conclusão de Curso apresentado
ao Departamento de Odontologia da
Universidade Federal de Sergipe como pré-
requisito para obtenção do título de Cirurgiã-
Dentista.

Orientador: Prof. Dr. André Luis Faria e Silva

Co-orientador: Mestranda Paula Fernanda
Damasceno Silva

ARACAJU - SE

2017

de Menezes, Rebeca Rayane Pereira

Tooth bleaching effect on color alteration and translucency is similar in enamel and dentin/ Rebeca Rayane Pereira de Menezes

Trabalho de Conclusão de Curso (Graduação em Odontologia) - Universidade Federal de Sergipe, Centro de Ciências Biológicas e da Saúde, Departamento de Odontologia – Aracaju, 2017.

Orientador: Prof. Dr. André Luis Faria e Silva

Co-orientador: Paula Fernanda Damasceno Silva

1. Dental enamel 2. Hydrogen Peroxide 3. Tooth Bleaching

Short communication

**TOOTH BLEACHING EFFECT ON COLOR ALTERATION AND
TRANSLUCENCY IS SIMILAR IN ENAMEL AND DENTIN**

Running title: Tooth bleaching at enamel and dentin

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Short communication

Tooth bleaching effect on color alteration and translucency is similar in enamel and dentin

ABSTRACT

This study evaluated the effects of tooth bleaching on alterations of translucency parameter (TP), and color of dentin and enamel. The color of specimens containing only enamel or dentin were measured over white and black backgrounds using a spectrophotometer (CieL*a*b), allowing the calculate the TP by difference between the color measured over each background. The measurement was repeated after tooth bleaching with 35% hydrogen peroxide and ΔE and ΔTP were calculated. Data were analyzed by Ttest ($\alpha = 0.05$). No difference was observed between dentin and enamel regarding alterations on TP and color.

Keywords: Dental enamel; Dentin; Hydrogen Peroxide; Tooth Bleaching; Tooth Discoloration.

INTRODUCTION

The tooth color is determined by combination among optical properties of enamel and dentin tissue, including translucency and chromaticity.¹ Due to high mineral content, the enamel is the more translucent structure of tooth allowing that the color of underlying dentin significantly affects the tooth color.² However, the enamel chromaticity modifies the perception of underlying dentin and also affected the tooth color.² In clinical cases of tooth discoloration, the tooth bleaching procedures using hydrogen peroxides are usually carried out to oxide the organic structure of tooth substrates resulting in lighter aspect.³ Considering the higher organic content and chromaticity of dentin, it is reasonable to relate

the bleaching effect mainly to optical modifications on this tissue. However, the role of each hard tooth tissue on bleaching effect remains controversial.⁴⁻⁷ Thus, the aim of this study was to assess the color alteration and on translucency of dentin and enamel submitted to tooth bleaching. The null hypothesis was that the tooth bleaching results in similar alteration on color and translucency when these hard tooth tissues are compared.

MATERIAL AND METHODS

Five sound third molars were sectioned parallel to buccal/lingual faces to obtain four slices. The inner dentin of slices containing the buccal and lingual enamel were removed using a diamond bur, remaining only the enamel. These slices were used to assess the optical modifications on enamel, while the other slices had the covering enamel removed and were used to analyze the alterations on dentin. Impression of these specimens were taken with dense silicon from to standardize the local of measurements during the entire experiment. A perforation with 6 mm of diameter was created in the mold to allow the placement of the spectrophotometer tip (Easy Shade Compact, Vita-Zahnfabrik, Bad Säckinge, Germany). The baseline color (CieL*a*b) at baseline was measured over white and black backgrounds to allow the translucency parameter (TP) calculation using the followed formula⁸: $TP = ((L_{white} - L_{black})^2 + (a_{white} - a_{black})^2 + (b_{white} - b_{black})^2)^{1/2}$. The specimens were submitted to tooth bleaching with 35% hydrogen peroxide (Whiteness HP Maxx, FGM, Joinville, SC, Brazil) with three consecutive applications of 15 minutes each. After bleaching procedures, the specimens were stored in water for 7 days prior to measurement of bleaching effect. The color was measured again under both backgrounds and TP calculated. The color alteration (ΔE) was calculated using only the data from white background using the followed formula: $\Delta E = ((L_{baseline} - L_{final})^2 + (a_{baseline} - a_{final})^2 + (b_{baseline} - b_{final})^2)^{1/2}$. Data of modification on TP ($\Delta TP = TP_{final} - TP_{baseline}$) and ΔE were individually analyzed by T-test ($\alpha = 0.05$).

RESULTS

The results for ΔE and ΔTP are displayed at Figures 1 and 2 respectively. The tooth bleaching resulted in similar values of ΔE ($p = 0.832$) and ΔTP ($p = 0.476$) for dentin and enamel.

DISCUSSION

In the present study the bleaching effectiveness on tooth tissues was evaluated using enamel and dentin separately, whereas these tissues are bonded under clinical conditions. This approach was performed in the present study once that the methodology used does not allow to evaluate the bleaching effect on each tissue using specimens containing both hard tissues. The outcomes demonstrated that the bleaching agent caused the same color and translucency alteration on both hard tissues, while the null hypothesis was accepted. However, it is important to emphasize that these findings did not indicate necessarily that both tissues contribute equally to bleaching effect achieved when an external bleaching procedure is carried out.

During the external tooth bleaching procedures, the bleaching agent is applied over the enamel and reach the underlay dentin after to diffuse through the former tissue. Thus, it is expected that a lower concentration of peroxide will reach the dentin than that applied over the enamel.⁹ Considering that the bleaching effect is related to peroxide concentration,¹⁰ it is reasonable to believe that a reduced color alteration could be observed for the dentin in this situation than that found the present study. Using the high-peroxide concentration over the dentin aimed to simulated an internal bleaching procedure in non-vital teeth. Interestingly, both hard tooth tissues had the same color alteration under the same peroxide concentration.

It has been reported that the bleaching effect of tooth tissue is related to oxidation of organic components.³ Thus, it could be expected higher bleaching effect on dentin, which present higher organic content than enamel. However,

other studies have reported that the enamel contributes more than dentin to tooth bleaching effect observed.^{5,7} The explanation is that the bleaching agent reduces the mineral content of enamel and this tissue became more opaque.^{5,7} Once that the enamel acts as filter to dentin color, the presence of more opaque enamel reduced the yellowness of dentin resulting in bleaching effect. In opposite to these previous findings, the results of present study did not demonstrate any modification (average values close to 0) on translucency parameter of enamel following the bleaching procedure, indicating that the color alteration was caused by other factor. The color change of enamel was strongly affected by lightness increasing ($L^* = 5.7$), in opposite to dentin ($L^* = -0.2$). Thus, it can be hypothesized that alteration on enamel surface roughness produce by peroxide affected the lightness, modifying the color perception.¹¹

CONFLICTS OF INTEREST

The authors deny any conflicts of interest related to this study.

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FIGURE LEGENDS

Figure 1. Box-plot of data from ΔE .

Figure 2. Box-plot of data from ΔTP . TP – translucency parameter.

FIGURE 1

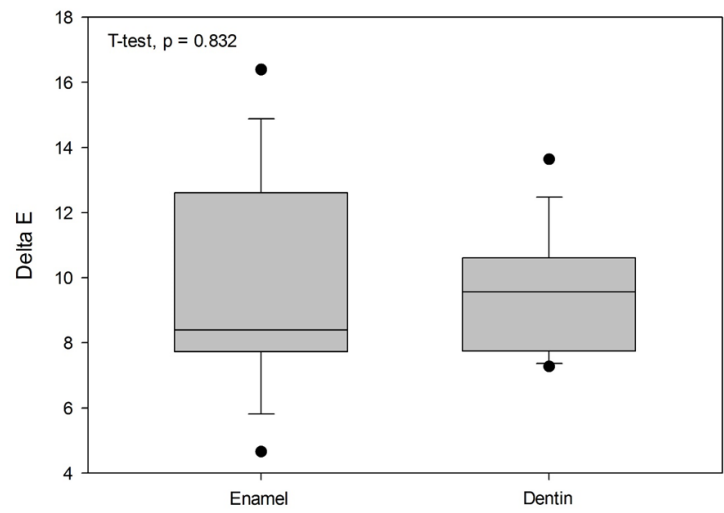


Figure 1. Box-plot of data from ΔE .

102x74mm (300 x 300 DPI)

FIGURE 2

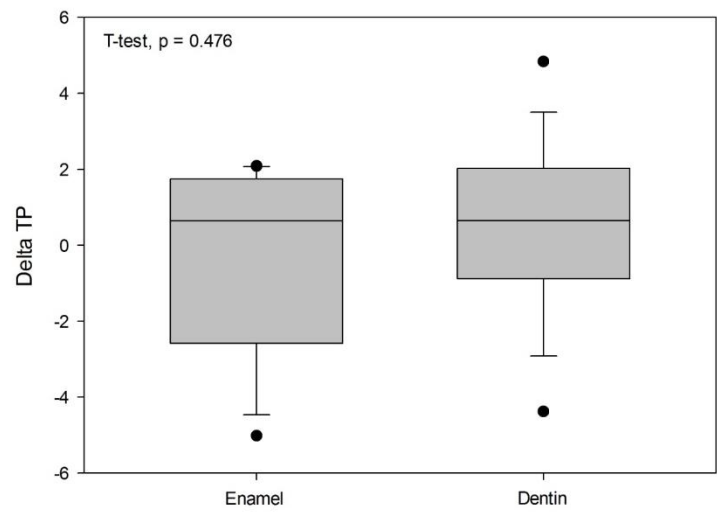


Figure 2. Box-plot of data from Δ TP. TP – translucency parameter.

102x74mm (300 x 300 DPI)

ANEXO A - PARECER CONSUBSTANCIADO DO CEP

HOSPITAL UNIVERSITÁRIO DE
ARACAJÚ/ UNIVERSIDADE
FEDERAL DE SERGIPE/ HU-



PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Alterações ópticas nos substratos dentais pós-clareamento com peróxido de hidrogênio em alta concentração

Pesquisador: André Luis Faria e Silva

Área Temática:

Versão: 1

CAAE: 58537716.7.0000.5546

Instituição Proponente: FUNDACAO UNIVERSIDADE FEDERAL DE SERGIPE

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 1.711.814

Apresentação do Projeto:

Subprodutos da quebra da molécula de peróxido de hidrogênio, base dos agentes clareadores, oxida a estrutura orgânica dos tecidos dentais tornando os dentes mais claros. Entretanto, a literatura ainda é controversa a respeito se o efeito clareador é principalmente resultado de alterações de cor do esmalte ou da dentina. Além disso, pouca informação está disponível sobre os efeitos dos peróxidos sobre a translucidez dos tecidos dentais, o que, em última análise, também afeta a cor do elemento dental.

Objetivo da Pesquisa:

Avaliar as alterações cromáticas e de translucidez da dentina e do esmalte dental submetidos a clareamento dental com peróxido de hidrogênio em alta concentração.

Avaliação dos Riscos e Benefícios:

Riscos:

Não se aplica, pois as intervenções serão realizadas em dentes isolados.

Benefícios:

Indiretos ao proporcionar maior conhecimento acerca dos efeitos dos agentes clareadores sobre os tecidos dentais.

Endereço: Rua Cláudio Batista s/nº

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HOSPITAL UNIVERSITÁRIO DE
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FEDERAL DE SERGIPE/ HU-



Continuação do Parecer: 1.711.814

Comentários e Considerações sobre a Pesquisa:

As intervenções serão realizadas em unidades dentárias obtidas por doação.

Considerações sobre os Termos de apresentação obrigatória:

Constam.

Recomendações:

Não há.

Conclusões ou Pendências e Lista de Inadequações:

Não há.

Considerações Finais a critério do CEP:

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_P ROJETO_769177.pdf	02/08/2016 18:05:41		Aceito
Outros	TermodoDoacao.pdf	02/08/2016 18:03:37	André Luis Faria e Silva	Aceito
Projeto Detalhado / Brochura Investigador	Projeto.pdf	02/08/2016 18:02:29	André Luis Faria e Silva	Aceito
Folha de Rosto	folhaDeRostoSigned.pdf	02/08/2016 18:01:55	André Luis Faria e Silva	Aceito

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

ARACAJU, 05 de Setembro de 2016

Assinado por:
Anita Herminia Oliveira Souza
(Coordenador)

Endereço: Rua Cláudio Batista s/n°

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ANEXO B - TERMO DE DOAÇÃO DE DENTES

TERMO DE DOAÇÃO DE DENTES

Ao Comitê de Ética em Pesquisa da Universidade Federal de Sergipe

Declaro que doei 05 terceiros molares ao pesquisador André Luis Faria e Silva, a fim de viabilizar a execução da pesquisa intitulada " Alterações ópticas nos substratos dentais pós-clareamento com peróxido de hidrogênio em alta concentração". Igualmente declaro que estes dentes foram extraídos previamente ao meu conhecimento da pesquisa supracitada, por indicação clínica e independente da mesma, sendo armazenados em frasco único, o que impossibilita a identificação dos indivíduos dos quais os dentes foram extraídos.

Local: Aracaju, 02/08/2016.



Nome do cirurgião-dentista

CPF: 454 514 195-15

CRO: 769

Endereço: Rua Celso, 215. Treze de julho. Aracaju - SE, 49020-170

Telefone: (79) 3211 - 0868

ANEXO C- NORMAS DA REVISTA

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Its scope, therefore, is broad, inclusive and international, but with a particular focus on Asia Pacific. The journal accepts the following types of manuscripts: laboratory investigations, clinical investigations, full reviews and mini reviews.

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- Dental Biomaterials
- Dental Pedagogy
- Endodontics and Traumatology
- Implant Dentistry
- Oral Biosciences
- Oral and Maxillofacial Surgery
- Oral Medicine
- Oral Microbiology
- Oral Pathology
- Orthodontics
- Oral Radiology
- Oral Rehabilitation
- Paedodontics
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Please note that Case Reports are no longer accepted.

- (i) Original papers,
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- (iii) Short communications,
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Please see below for the submission details of each category of paper and note carefully the instructions.

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Abstract: 200 words maximum and must include subheadings

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Full Review Articles

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Abstract: 200 words maximum, unstructured

References: no limit

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Minireviews. Minireviews are expected to be focused discussions of defined topics. A topical outline should be provided to the Editor-in-Chief for approval prior to submission of the completed minireview manuscript in Rapid Review. Minireviews are not expected to be comprehensive reviews of the literature but rather focused discussions of specific topics.

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References: no more than 30
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These manuscripts are to provide an opportunity for the presentation of preliminary or brief observations that do not warrant a full paper. The manuscript should be prepared in the same format as an Original Article.

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PREPARATION OF THE MANUSCRIPT

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Abbreviations. Abbreviations should be used sparingly – only where they ease the reader's task by reducing repetition of long, technical terms. Initially use the word in full, followed by the abbreviation in parentheses. Thereafter use the abbreviation only.

Trade names. Drugs should be referred to by their generic names. If proprietary drugs have been used in the study, refer to these by their generic name, mentioning the proprietary name, and the name and location of the manufacturer, in parentheses.

Genetic nomenclature. Standard genetic nomenclature should be used. For further information, including relevant websites, authors should refer to the genetic nomenclature guide in *Trends in Genetics* (Elsevier Science, 1998).

Parts of the manuscript

The manuscript should be submitted in separate files: title page, main text file, figures.

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The title page should contain:

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- (ii) the full names of the authors and
- (iii) the addresses of the institutions at which the work was carried out
- (iv) the full postal and email address, plus telephone numbers, of the author to whom correspondence about the manuscript should be sent. The present address of any author, if different from that where the work was carried out, should be supplied in a footnote.
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The main text file should be presented in the following order:

- (i) Abstract and key words,
- (ii) Text consisting of Introduction, Material and Methods, Results and Discussion,
- (iii) Conflict of Interest and Sources of Funding Statement,
- (iv) Acknowledgements
- (v) References,
- (vi) Appendices,
- (vii) Tables (each table complete with title and footnotes).
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Conflict of Interest and Sources of Funding Statement

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Acknowledgments

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Book:

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