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Tanta Dental Journal 12 (2015) 302–307

www.elsevier.com/locate/tdj

The effect of light activated bleaching versus orange juice on enamel's micro-hardness

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Received 19 May 2015; revised 29 September 2015; accepted 30 September 2015
Available online 22 November 2015

Abstract

Objective: To evaluate the surface micro hardness of enamel bleached with 38% H_2O_2 (Light activated) versus tetra pack orange juice.
Method: A total sample of (n = 23) sound crowns of human third molars, which were extracted because of periodontal reason were included in the study. Longitudinal sections were made at buccolingual direction using diamond disks (0.2 mm) under water lubrication to obtain enamel slabs measuring (3 mm × 3 mm) then slabs were embedded in polystyrene resin by using 2.0-cm-diameter PVC molds, leaving the external enamel surfaces uncovered by the resin. After 24 h, enamel slabs were removed from the molds. These 45 enamel slabs were further subdivided in to 3 groups (A, B, C). Each group contains fifteen specimens. Group A was placed in artificial saliva at 37 °C within the incubator (Memart, Germany). Whereas, Group B was treated with Power whitening gel (whitesmile 2011, Germany) activated with light and Group C was immersed in orange juice. Micro-hardness measurements were performed on specimens' pre and post treatment with orange juice immersion and bleaching. Data analyses were performed by using Statistical Package of Social Sciences (SPSS) v. 20.0. Assessments of changes in micro hardness on different time interval as well as due to different materials were analyzed by RMANOVA with post hoc.
Results: Surface micro hardness decreased from 152.8 (S.D. 1.86) to 152.1 (S.D. 2.03) in Group A ($p = 0.546$). A much smaller reduction in the surface micro hardness was also noticed in Group B from 152.8 (S.D. 1.86) to 152.1 (S.D. 2.03) ($p = 0.384$). Statistically significant reduction in surface micro hardness was observed in the Group C ($p < 0.0001$) but not in the hydrogen peroxide and the control groups ($p > 0.05$).
Conclusions: Enamel surface becomes considerably softer and rougher after orange juice challenge as compare to 38% hydrogen peroxide bleaching.

Keywords: Bleaching; Tetra packs orange juice; Micro-hardness; Dental enamel; Hydrogen peroxide

1. Introduction

In recent years, the demands of a brighter and beautiful smile has grown exponentially because of the fact that smile is an important part in social communication that's why patients demand regarding an

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Peer review under the responsibility of the Faculty of Dentistry, Tanta University.

http://dx.doi.org/10.1016/j.tdj.2015.09.002
1687-8574/

esthetic treatment has been increased [1]. In the world of esthetic dentistry, tooth whitening with different concentrations of hydrogen peroxide (HP) is found to be the commonly performed technique that can be done at home or in-office with and without light activation [2].

Each of the bleaching agent as well as application technique have its own advantages and disadvantages which are as follow; one of the important benefit of in-office technique is that the whole procedure is under the control of the practitioner with proper protection of soft tissue and excellent esthetic results that can be achieved in a short span of time [3]. The procedure is further accelerated by power bleaching. Therefore, various light sources are used to energize the bleaching material to accelerate the chemical procedure; bleaching material takes up the energy from the light sources and accelerates the breakdown of peroxide molecule which increases the rate of peroxide decomposition thereby improving the outcome [4]. Despite of its many advantages, there are some disadvantages as well, such as alteration in the organic compound of enamel with loss of calcium, thus reducing micro-hardness, increases porosity and pulpal irritation; altogether attributed towards high concentration associated with acidic pH of bleaching agent [5]. Erosion is found to be, one of the drawback resulted from the application of bleaching agent, on enamel because of its partial demineralization causing softness and roughness of the tooth structure [6,7].

Furthermore, it has been reported that because of low pH of the bleaching agent causes alteration in mineral content of the enamel and dentine resulting in weakening of mechanical property [8–10]. Moreover, most of the soft drinks, including sodas and fruit juices (especially tetra pack) are also responsible for lowering pH, as main constituent of them are malic acid, citric acid, ascorbic acid or lactic acid [11]. It has been known that juices and sodas have high acidic content, and their interactions with hydroxyapatite crystals on enamel carboxylic acid chemically adsorb on to the enamel surface dissolves Ca^{++} ion out of the enamel surface and negatively affect enamel hardness [12].

Hence, literature have shown that altogether bleaching agent and tetra pack juices can affect hardness of the enamel, but till date, no study has report the comparison of both erosive agents, which helped us to set objective of study. This current research will help us in understanding the effect of commonly used high concentration of power bleaching on enamel. In relation to the effect of a regular dietary consumption of tetra pack orange juice. Thus, in people who take sodas and fruit juices on regular basis, this will result in potentially serious ill health on their teeth.

The aim of the present in vitro study was to evaluate the effect of high percentage of bleaching agent with light activation and tetra pack orange juice on micro-hardness of human enamel.

The hypothesis of current study was that the use of tetra pack orange juice affecting micro-hardness of as enamel compare to light activated bleaching.

2. Methodology

2.1. Specimen preparation

Twenty three sound human third molars were stored in thymol solution (Buffered 0.1% pH 7.00) for about one week; storage and handling of extracted teeth were done according to ISO/TS 11405. Hard and soft deposits were removed with ultrasonic scaler. The transversal section was made at cementoenamel junction dividing the root and crown portions with the help of Digital low speed cutting saw (SYJ-150, MTI Corp, California, USA) under water spray as shown in Fig. 1. The pulp was removed from its chamber by meticulous excavation and irrigation. Longitudinal sections were made at buccolingual direction using diamond disk in Digital low speed cutting saw (SYJ-150, MTI Corp, California, USA) under water spray to obtain enamel slabs measuring which was supported with dentine (3 mm × 3 mm). Each slab is measured with vernier

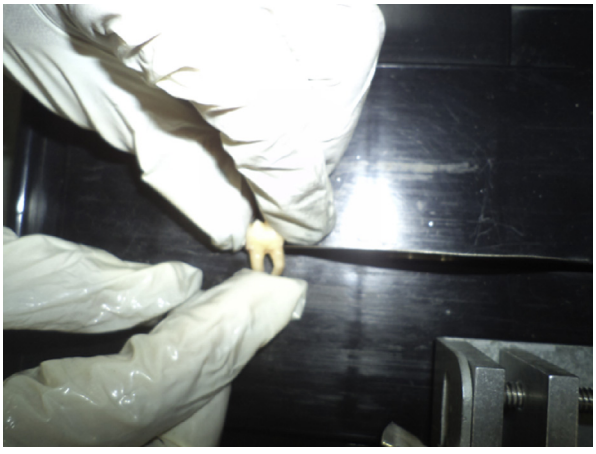

Fig. 1. The transversal section was made at cementoenamel junction dividing the root and coronal portions with the help of Digital low speed cutting saw (MTI Corp; USA) under water spray.