THE COMPRESSIVE STRENGTH OF BLEACHED TEETH

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REZUMAT

Obiectiv. La ora actuală, solicitările pacienților pentru albirea dinților au crescut, dar efectele în timp ale tehnicilor folosite nu sunt încă suficient cunoscute. Ca rezultat al albirii dinților poate apăra scăderea rezistenței dinților și/sau afectarea pulpară la dinții vitali.
Scop. evaluarea, in vitro, rezistenta la compresiune a dintilor asupra carora s-a actionat cu agenti de albire comparativ cu un lot martor.
Rezultate. Rezultatele au relevat scăderea rezistenței la compresiune a dinČilor albiți, în functie de principiul activ al materalului de albire folosit.
Cuvinte cheie. Agent de albire; Rezistența la compresiune a dinților

ABSTRACT

Objective.
Currently, the patients solicitations for bleached teeth have raised, yet there are not known enough the effects in time of the used techniques. Procedures for teeth bleaching can lead to a decrease in teeth resistance as well as the pulp involvement of vital teeth.
Aim. of our study is an in vitro evaluation of compressive strength of teeth submitted to bleaching agents as compared with a control group.
Results. showed a low compressive strength of bleached teeth, according to the chemistry of the used bleaching material.
Key Words: Bleaching agent; Compressive strength of teeth

INTRODUCTION

Very often in dental practice, we are confronted with color modifications of one or more teeth due to different reasons.[1] These color modifications can affect vital teeth (internal or external causes) or non-vital teeth (as a consequence of pulpal complications or endodontic treatments), and cause inconveniences for the patient.[2]

At present we dispose of a large scale of therapeutic possibilities.[3,4] The most conservative method is the teeth bleaching by using different products containing carbamide peroxide in various concentrations.[5,6] Unfortunately, the long-term effects of the used techniques are not well-known. The current work show a low compressive strength of the bleached teeth, and the pulp affection of vital teeth.[7,8]

AIM

The aim of our study is to evaluate, in vitro, the compressive strength of teeth upon which bleaching agents acted, compared with that of natural teeth.[9]

Materials and methods

The crowns of four human recently extracted teeth (central upper incisors) were horizontal sectioned. The sections were about 6 mm diameter (depending on crown diameter) and 2 mm thick.

The obtained samples were introduced in

- Physiological salt solution- group A (control group)
- Viva Style (Viva Ivoclar)-gel containing 10-18%-carbamide peroxide- group B
- Opalescence Xtra (Ultradent)- gel containing 35% carbamide peroxide - group C
- Hydrogen peroxide 30%- group D.

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The procedure consisted in introducing teeth slices in each bleaching material separately, for about 48 hours; the materials were continuously refreshed to avoid drying.

The measurement of the treatment effect upon the bleached teeth and their breaking resistance, was performed using compressive trials, at The Department Strength of Materials, Mechanical Engineering Faculty, Politehnica University of Timisoara, Chief of Department Prof. Dr. Nicolae Faur.

The compressive trial consists in the application of two equal opposite forces upon the test sample placed between the compressive machine plates. The compressive force is measured along the trial by a mechanic or electronic measure system.

Since forms and dimensions of teeth are practically unique for each tooth and individualized and we needed to generalize the results, some samples had to be placed between the plates and to have their dimensions measured in order to evaluate the breaking section. The samples were obtained by sectioning the teeth along normal planes on their longitudinal axis.

The scheme of the samples arrangement in the compression testing machine is represented in Figure 1.

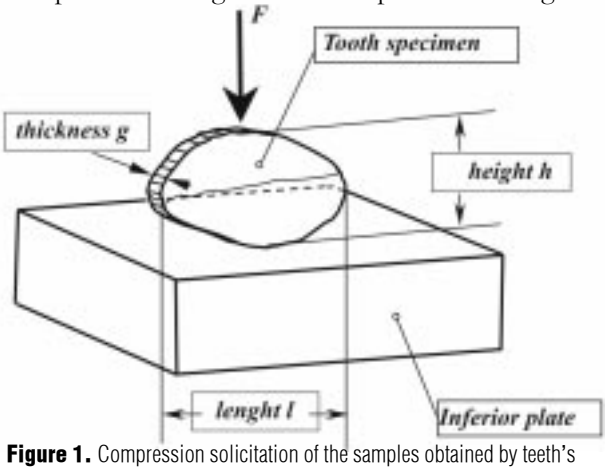

Figure 1. Compression solicitation of the samples obtained by teeth's

The compressing testing machine was adjusted with a system that allows the correct arrangement of the tested samples during the trial, by self centralization.

The general scheme of the used compression machine as well as its details is presented in Figures 2,3.

Figure 2, 3. Details of the compression trial machine

The compressive strenght was calculated with the next formula:

$$\text{Compressive strength} = \frac{\text{Breaking force}}{\text{Breaking area}}$$

$$\text{Breaking area} = g \times l$$

Table 1. Dimensions of the samples depending on categories of treatment

Category	Specimen	Breaking Force [N]	Height h [mm]	Length l [mm]	Thickness g [mm]	Breaking Area [mm^2]	Maximum Compressive strength [MPa]	Medium Compressive strength [MPa]
A	1	880	3.70	6.40	2.10	13.44	65.48	
	2	840	5.30	7.00	2.00	14.00	60.00	
	3	415	3.70	4.50	1.00	4.50	92.22	72.57
B	1	240	7.00	7.00	1.80	12.60	19.05	
	2	60	5.20	6.00	1.00	6.00	10.00	
	3	250	7.70	3.40	1.55	5.27	47.44	
	4	580	6.50	3.50	1.70	5.95	97.48	43.49
C	1	250	7.00	4.00	2.00	8.00	31.25	
	2	420	2.70	7.00	1.30	9.10	46.15	38.70
D	1	150	5.30	7.00	1.70	11.90	12.61	
	2	280	5.00	8.00	2.20	17.60	15.91	
	3	570	5.20	8.00	2.00	16.00	35.63	21.38

Because the height of the used samples was not uniform, the breaking was random and independent of "h".

RESULTS

As seen in Table 1, the values obtained for the control sample, yet lower than those described in the literature due to different testing machines, were comparatively higher than those of the treated samples.

Differences have been observed even among the group of teeth treated with bleaching agents (B, C, D), depending on the type and concentration of the used bleaching material, as seen in Figure 4.

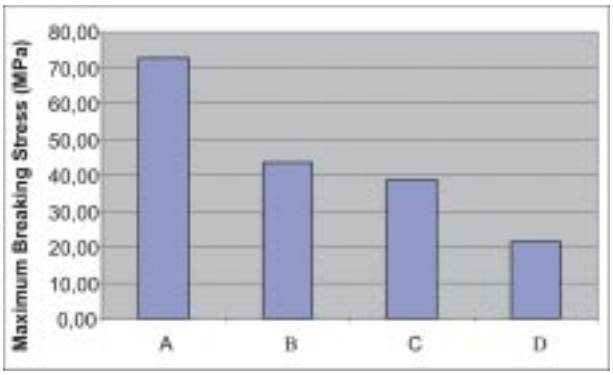

Figure 4. Variations of the maximum compressive strength on sample categories

DISCUSSIONS AND CONCLUSIONS

1. Utilization of bleaching agents reduces the compressive strength of teeth.[10]

2. The bleaching products with a low carbamide peroxide concentration produce the lowest reduction of the compressive strength of teeth.

3. Hydrogen peroxide 30% has the most deleterious action upon strength of the strength of the teeth.

4. We consider that concerning the teeth resistance, a concentration up to 10% carbamide peroxide is recommended, even when the treatment is prolonged.

5. The research regarding the resistance at compression should be accompanied by testing the effect of bleaching products upon the vitality of the dental pulp.[11,12]

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