

"IN VITRO" EVALUATION OF TWO HEAT SOURCES FOR DENTAL BLEACHING

AVALIAÇÃO "IN VITRO" DE DUAS FONTES DE CALOR USADAS EM CLAREAMENTO DENTAL

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ABSTRACT

The purpose of the present investigation was to evaluate thermic conductivity of dental structures, using two sources of heat: a tamper heated to red hot and a modified pyrograph. The results were obtained, using the thermo-catalytic bleaching technique, when the chemical reactions of peridrol (concentrated peroxide) and sodium perborate were increased by both heat sources mentioned above, positioned inside the access cavity. Temperatures measures were obtained using precision thermometers on the buccal surface at the cervical portion, serving as a base for the discussed results. It was concluded that the use of a modified pyrograph needed a lower temperature to obtain the same results as well as provide a longer useful working time, thus favouring the clinical operatory procedure.

UNITERMS: Dental bleaching

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INTRODUCTION

Maintaining the facial aesthetics is of fundamental importance for the social equilibrium of an individual. Among the component structures of the face, dental "normality" collaborates significantly in maintaining this arrangement. In such case, chromatic alterations of the dental crown, when present, can significantly compromise the harmony of all the structures involved.

Among the recommended techniques, with the intent of reestablishing the original colour of the dental crown, called bleaching agents, one can emphasize the thermocatalytic¹. This procedure is thus called because it originates from an active chemical reaction with a heat source.

Faced with the chemical elements used, the action of peridrol must be outstanding by the positive results presented^{4,8,9,14}. Its use however must be associated with perborate of sodium, with the purpose of obtaining a controlled reaction for as long a period as possible.

The use of a heat source significantly increases favourable prognosis^{2,4,8}.

The action of the bleaching substances developed an exothermic reaction, with ample liberation of oxygen which penetrates the interior of the dental tubules, removing the chromatic agents. Thereby, the permeability of the dentine is significantly increased¹³. Nevertheless, further crown discolouring can again occur^{5,6,9,10}, depending on the technique and type of restoration material used. Since even making use of aesthetics materials like composite resins, where it is possible to copy the original colour of the dental crown, significant alterations will be present, such as the absence of the pulpal

organ. Nevertheless, a colouration which is a little brighter must serve as a reference for the termination of the bleaching procedure.

The consequences of this clinical procedure are discussed. Some authors^{7,12} report a certain disposition to radicular resorption when studying traumatised teeth submitted to dental bleaching. These researchers believe that the chemical substances associated with the thermic source promote a large alteration in the pH^{6,11}, changing it eminently acidic, thus irritating the neighbouring tissue. Nevertheless other authors believe that these external resorption of the root are associated with the establishment of microorganisms in the empty dentine tubules³, which once established, develop a microbic colony, consequently introducing the presence of acidic hydrogenases enzymes, developing resorption mechanisms. This explanation is evaluated as a defence by the organisms.

However, one may rightfully emphasize that the consequences originating from these operating procedures, do not actually present significant values in the obtained clinical findings. It became imperative, at that rate, to develop the investigation in the way so one could observe the real effects and possible consequences on the supporting tissue, when using techniques that combine chemical substances with a heat source, such as the one used in dental bleaching.

PROPOSAL

The purpose of the present study was to evaluate the transmission of heat on the cervical third of the dental surface, when the application of red hot heated tampers and a pyrograph* (modified), are used as heat sources in the techniques of dental bleaching.

* Pyrograph Palante model M10 collegial IV 10 AMPS 110-220 V. 5 temperatures.

MATERIALS AND METHODS

For the present study, upper central incisors teeth were selected randomly and hydrated in physiological saline solution, during their period of storage. Placed in a mannequin type Inodon, taking care to draw them back 3 mm from the rubber that simulates the marginal gum, so that all the dental tissue of the cervical region may be seen. After immobilizing the specimens with chemically active acrylic resin, surgical access preparation was performed according to PAIVA and ANTONIAZZI¹⁴(1988) and divided into two groups (G1 and G2). The following methodology were employed.

Group G1

Thermo-catalytic bleaching technique I presenting the following components:

- 1) chemical substances used: peridrol and perborate of sodium;
- 2) heat source: tamper type Paiva heated to red hot;
- 3) with the help of a surface digital thermometer Claston-Tastoterm resolution 0.1°C, sensitive to contact, the following temperatures were obtained:

\bar{X}_{TS} - Average of temperatures obtained at the point of the instrument = $\frac{\bar{X}_{t1} - \bar{X}_{t2}}{2}$

\bar{X}_{TC} - Average of temperatures obtained on the cervical third.

\bar{X}_{DC} - Average heat absorption of the dental tissue.

\bar{X}_{T1} - Average time in seconds of the heat emission by the source.

\bar{X}_{T2} - Average time in seconds, to obtain the maximum degree of temperature on the cervical third.

Group G2

Thermo-catalytic bleaching technique II (AUN e MOURA¹, 1988) presenting the following components:

- 1) chemical substances utilized peridrol and perborate of sodium;
- 2) heat source: pyrograph (modified), when the same variations of temperature were obtained: (\bar{X}_T , \bar{X}_{TC} , \bar{X}_{DC} , \bar{X}_{T1} , \bar{X}_{T2})

RESULTS AND DISCUSSION

The radicular resorption presented in the literature as a consequence of the bleaching process, from our point of view constitutes the assertion discussed. It is clear that these findings have not come from being observed clinically except isolated cases and related as trauma and orthodontic movement. Thus the thermo-catalytic technique has been largely used in specialized courses and private clinics. Since their invention^{15,16}, without being registered the accidents above mentioned. On the other hand, the potential by the application of a heat source to the chemical reactions, presented largely satisfactory results.

Nevertheless, the maintenance of the biology constitutes a fundamental condition, justifying, at a rate, the carrying out of these tests, that have in view to make clare, the possible consequences on the periodontal tissues at the cervical third level, with the application of different heat sources, such as a red hot tamper or a modified pyrograph.

From the analysis of the results (Table 1), the following observations are possible.

The temperature at the point of the red hot heated tamper shows that the readings were not equal in the measurements taken, that is, $\bar{X}_{T1} < \bar{X}_{T2}$. These findings lead use to infer that there is an accumulation of heat at the extremities of the heat source, hindering at

Table 1 - Average temperatures obtained from the test bodies, description of the materials and methods.

Times heat sources	\bar{X}_{TS}	\bar{X}_{TC}	\bar{X}_{DC}	\bar{X}_{T1}	\bar{X}_{T2}
Tamper	131.3° C	39.1° C	92.2° C	2'	10'
Pyrograph	123° C	39.1° C	83.9° C	28.9'	10'
	8.3° C	—	8.3° C	26.9'	10'

that rate, a control of heat to be applied. On the other hand, when it is measured in the various phases of the experiment, the point of the pyrograph, one can observe that the readings were consistant: $\bar{X}_{T1} = \bar{X}_{T2}$, thus showing a possibility of maintaining constant the heat to be used.

Another result to be observed is when one analyses the temperature of the heat source applied and that obtained at the cervical third. In this case one can see that the modified pyrograph requires 10°C less than the tamper to obtain a maximum value of 39.1°C on the buccal wall.

These findings probably depend on the duration time of the heat source which is 28.2' in the case of the pyrograph and only 2'' for the tamper. That being so, one analyses the low termic conductability of the tooth wich absorbs basically all the heat applied, varying only 2°C on the external region of the tooth. Showing that the useful duration time of the source is an aspect of fundamental importance.

When one measures the time in seconds necessary to raise the temperature from 37°C to 39°C on the cervical third, one can verify that the time is equal for the two sources

studied, only that these reults can vary clinically, due to a series of factor involved, such as the thickness of the enamel and the remaining dentine and the temperature of the tooth to be bleached.

It is important to emphasize that the techniques which uses a continuous heat source, such as the modified pyrograph, allows not only the application of a lower temperature, but also a longer and controlled useful working time, keeping the same efficiency, and combining the physical and biological advantages.

CONCLUSIONS

From the results of the study was concluded that:

1. The pyrograph requires 10°C less to obtain the same clinical results when compared with the tamper.
2. The structural dentine-enamel couple is a very poor conductor of heat.
3. The temperature obtained on the cervical third level does not show any damage to the periodontal tissues, registering an increase of 3°C above body temperature.

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RESUMO

Análise da condutibilidade térmica de estruturas dentais, quando do uso de duas fontes de calor: calcador aquecido ao rubro e pirógrafo modificado. Os resultados foram obtidos usando-se a técnica termo-catalítica de clareamento, onde as reações químicas do peridrol (peróxido concentrado) e do perborato de sódio foram aumentadas pelas duas fontes de calor acima mencionadas, posicionadas na cavidade de acesso e as temperaturas foram medidas usando-se termômetro de precisão colocado na superfície vestibular da região cervical. Conclui-se que o uso do pirógrafo modificado necessita uma temperatura menor para se obter os mesmos resultados, assim como determina um maior tempo de trabalho, favorecendo os procedimentos operatórios.

UNITERMOS: Dente, branqueamento

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