

The effect of Power Bleaching on Temperature Rise and Color Changes of Anterior Teeth Using Different Light Sources

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By

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Dedication

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List of Abbreviations

H ₂ O ₂	Hydrogen peroxide
HO ₂	Perhydroxyl anion
CP	Carbamide peroxide
SP	Sodium Perborate
OH [•]	Hydroxyl radical
CO ₂ laser	Carbon dioxide laser
Nd:YAG	Neodymium: yttrium aluminum garnet
IR-A	Infra-red
NIR	Near infra-red
GaAlAs	Gallium-Aluminum-Arsenide
UV C	Lower ultra-violet
QTH	Quartz–tungsten–halogen
LED	Light emitting diode
VC	Vitapan Classical shade guides
BG	Vita Bleached guide 3D-Master
ΔE	Color change
CIE	Commission Internationale de l’E’clairage
PAC	Plasma arc light
HL	Halogen light

GL	Green LED
GL+IL	Green LED associated with infrared diode laser
BL+ IL	Blue LED associated with infrared diode laser
DL	Diode Laser
Nm	Nano meter
S D	Standerd Deviation
W	Watt
SGU	Shade Guide unit

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I. INTRODUCTION

Tooth whitening has become one of the most rapidly growing oral care treatments, motivated by patient demands for both healthy teeth and cosmetically appealing smiles.

The cosmetic impairment of teeth, especially in the anterior region, can be treated by a number of invasive treatment modalities such as crowns and veneers, micro abrasion, or by the placement of composite restorations. In certain clinical situations, the procedures of tooth whitening or bleaching can be employed as a less invasive alternative to either ceramic or resin composite restorations.

A number of methods and approaches have been described in the literature for vital teeth bleaching. These methods involve different bleaching agents, concentrations, application times, application mode and light activation¹⁻³. The great majority of bleaching agents have hydrogen peroxide as an active ingredient. Hydrogen peroxide is capable of oxidizing a wide range of colored organic and inorganic compounds, causing decolorisation and hence bleaching of the substrate.

Office-bleaching or power bleaching procedures seem to be an appropriate alternative, especially in cases of severe discoloration of a single tooth, lack of patient compliance or if a rapid treatment is desired. It differs from home bleaching methods because it generally uses relatively high concentrations of the whitening agents.

There is great concern about the heat generated by the light source in light activated bleaching procedures. It may cause varying degrees of pulp response.

Previous studies using different light sources demonstrated that differences in temperature changes depend on the type of light employed and may be critical or not for pulpal health⁴⁻⁸.

Despite the fact that many bleaching systems have been introduced into the dental market, the proper selection of a bleaching system that offers the optimum tooth beaching with the minimal pulp response is still controversial. Therefore, this study aimed to evaluate the effect of different bleaching systems on the color change and temperature rise that may affect the teeth.

II. Review of literature

I. Tooth color from normal to pathological

I.1. Normal Tooth Color:

The tooth color is highly subjective, ranging from highly translucent at the incisal edge to dark yellow-brown-reddish at the gingival margin. Therefore, teeth are polychromatic with higher chroma at the gingival third, lower chroma and higher value in the middle third, with more translucency in the incisal area (halo effect). It may seem that the enamel alone is responsible for the color of the tooth. In fact, the four dental tissues (pulp, dentin, enamel and cementum) are involved in creating the final shade of each tooth, even though most of them are actually invisible to the eye⁹.

Numerous studies have shown that dentin plays a major part in the final shade of a tooth, probably far more than enamel. Various assumptions and experimental evidences have led to the conclusion that enamel has a certain degree of translucency, but no intrinsic color. It would seem therefore that enamel acts as a sort of bioglass that filters the natural color of the dentin¹⁰.

The color of the teeth is influenced by a combination of their intrinsic color and the presence of any extrinsic stains that may form on the tooth surface. Intrinsic tooth color is associated with the light scattering and adsorption properties of the enamel and dentine, with the properties of dentine playing a major role in determining the overall tooth color¹¹.