

# Evaluation effect of an in-office zoom bleaching gel agent on the surface texture of three contemporary restorative materials

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## Abstract

This in vivo study evaluated the effects of an in-office Bleaching Zoom gel agent on the surface texture of three contemporary restorative materials; an appropriate bleaching procedure was performed on the specimens of each group. Scanning electron micrographs were produced at 60x, 200x, 1500x, and 2000x magnifications of the respective areas of the samples.

The results showed that the effect of bleaching on the surface texture was material and time-dependent. Within the limitations of this study, it was concluded that bleaching with Zoom gel (25% hydrogen peroxide) did not cause major surface texture changes on the restorative materials.

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**Keywords:** Bleaching; Surface texture; Beautiful II; IPS empress direct; Ceram.x.mono; Replica impression

## 1. Introduction

The public interest and demand for “aesthetic dental procedures” has never been greater, and a beautiful smile has become a kind of business card nowadays [1]. Aesthetics, by definition, is the science of beauty; that particular detail of an animate or inanimate object that is appealing to the eye which has witnessed it [2]. The main objective of restorative dentistry is to replace damaged tooth structures with materials that possess biological, physical, and functional properties similar to those of natural teeth [3].

Attractive teeth have always been the typical patient's primary concern. In the past, dentists were often dismayed by a patient's disappointment with a “perfect restoration,” painstakingly crafted from the finest gold or other material with minimized enamel reduction and long-lasting preservation of function. The patient, of course, had hoped the restoration would mimic the appearance of the original teeth. Today, by taking full advantage of new materials and techniques, dentists can often meet or even exceed such expectations [2,4].

Bleaching is now one of the most common aesthetic treatments for adults (Anderson, 1991); but bleaching is not new. The earliest efforts to lighten teeth through bleaching in clinical practice took place more than 2 centuries ago, with bleaching agents painted directly

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onto the tooth or packed inside a non-vital tooth. The most effective material was considered hydrogen peroxide [5]. This bleaching agent made bleaching treatments efficient at removing intrinsic stains. Most of the present-day vital bleaching materials contain hydrogen peroxide in some form, or as carbamide peroxide, which breaks down into hydrogen per-oxide [6]. Various methods of vital bleaching have been developed and used over the years. In-office bleaching has been the most common technique during the last 20 years [7]. In-office bleaching is useful for removing discolorations by using a high concentration of hydrogen peroxide (35–38%). The dentist is in complete control of the process throughout the treatment. This provides the advantage of being able to terminate the bleaching process at any time. Studies have shown that higher concentration materials bleach teeth faster. These materials usually work so rapidly that visible results can be observed even after a single visit [8–10].

One important consideration with regard to a restorative material is that the appearance of a restored tooth can be spoiled by the restoration having a matt surface finish, thus making it stand out from the rest of the teeth. The simplest way to assess this is by visually using an impression replica examined under a light microscope or a scanning electron microscope (SEM). It can also be numerically assessed by using a profilometer.

Swift [11] and Haywood [5] reported that bleaching techniques have no significant effects on the color or physical properties of porcelain or other ceramic materials, as well as amalgam or gold. Using a scanning electron microscope [5,11], Bailey and Swift (4) observed slight surface changes in microfilled and hybrid composites after immersion for 4 h daily in fresh bleaching gel [4]. The SEM observations of Turker and Biskin [12] showed only slight changes on the surface of the restorative materials after home bleaching. In a study by Wattanapayungkul et al. [13], the SEM images showed numerous cracks on the surface of the restorative materials after home bleaching. The authors Turker and Biskin [12] and Wattanapayungkul and Yap [14] also studied the effects of bleaching on the surface roughness of restorative materials, and found no significant difference in roughness between the control and bleached groups.

To date, no literature data exists on bleaching with 25% hydrogen peroxide, or on the effects of bleaching on currently-used dental restorative materials. Therefore, this in vivo study evaluated the effects of in-office bleaching agents on the surface morphology of three different aesthetic restorative materials.

## 2. Methods and materials

### 2.1. Patient selection

The research proposal and study design were approved by the Aesthetical Committee of Research and the IRB at Beirut Arab University. A total of 15 subjects, 18–45 year olds with one or more defective class IV restoration or class IV caries, including the labial surface of the maxillary anterior teeth, were included in the study. Institutional Review Board (IRB) consent forms were obtained from the patients.

The subjects were selected from the outpatient clinic of the Faculty of Dentistry at the Beirut Arab University according to the following exclusion criteria:

1. Subjects who had used bleaching products in the past three years.
2. Subjects who were smokers.
3. Subjects who had had periodontal surgery or scaling carried out in the previous six months.
4. Subjects with chronic periodontitis or signs of pathological origin, or with radiographic signs of pulpal or periapical pathology.
5. Subjects with severe medical complications that would interfere with the study (liver disease, sensitivity to peroxide products etc.).
6. Subjects with systemic diseases or who were taking medication that caused tooth discoloration or Xerostomia.
7. Subjects with severe bruxism, tooth clenching, or unstable occlusion.
8. Subjects with tetracycline stains.
9. Subjects with a previously developed sensitivity to hydrogen peroxide products ( $H_2O_2$ ).
10. Any cavities where the gingival wall surpassed the cement-enamel junction to ensure all the cavity walls were on the enamel, or if a carious pulp exposure with obvious bleeding occurred.

The preoperative clinical evaluation included complete medical and dental histories, anterior maxillary per apical radiographs, an assessment of pulp vitality and tooth sensitivity, or any history of pain. The subjects were informed about all the details of this investigation and they signed IRB consent forms to participate in this study.

### 2.2. Grouping

All 15 subjects (36 restorations) were evaluated before bleaching (baseline) after one week of restorations prior to the bleaching treatment and then two days, three months, six months, and one year after bleaching. Evaluation was performed on the replica

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