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Case Report

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Office type vital teeth bleaching: presentation of four cases

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ABSTRACT

The tooth color, which is primarily determined by the dentin tissue, is also influenced by the color, transparency, and thickness of the enamel. Color changes in teeth that occur over time due to intrinsic or extrinsic factors are a significant aesthetic issue that requires treatment. Discoloration, especially in the front teeth, leads to a loss of self-confidence in patients, and as a result, they are unable to smile comfortably. It is usually possible to remove extrinsic stains, which are associated with poor oral hygiene and the consumption of certain foods and beverages throughout the day, using mechanical cleaning methods. In the removal of intrinsic stains, vital whitening (bleaching) is preferred over more invasive treatment methods. Vital tooth whitening, which is considered a minimally invasive approach, includes procedures performed by the dentist in the office (in-office) or at home by the patient under the dentist's guidance. In both applications, the active ingredient in the materials used is hydrogen peroxide (H_2O_2) or carbamide peroxide. These agents can be used alone or in combination with activation methods such as heat or light. The aim of this study is to demonstrate the effectiveness of in-office whitening treatments in various discoloration cases.

Keywords: Tooth discoloration, vital bleaching, hydrogen peroxide

INTRODUCTION

In recent years, the pervasive influence of visual-based mass media has significantly increased individuals' awareness of their appearance, thereby highlighting the importance of smiling as both a social and aesthetic norm. This shift in societal values is reflected in the field of dentistry, where the primary objective is to offer patients a natural and aesthetically pleasing smile that aligns with their personal aspirations.[1] Thanks to aesthetic dentistry applications, both the issues affecting the smile, such as those in the teeth, gums, and surrounding tissues, are addressed, and patients' speech, biting, and chewing functions are enhanced.[2,3]

The change in tooth color largely depends on how the incoming light is absorbed or reflected by the tooth surface. Therefore, any damage to the tooth structure may lead to a change in its appearance.[4]

There are various causes of tooth discoloration, including environmental, genetic, and developmental factors. Tooth discoloration, which can be classified based on its etiology or localization, is fundamentally a multifactorial phenomenon. These discolorations may result from aging, inadequate oral hygiene, intra-pulp hemorrhages due to trauma, pre- or post-dental treatments, as well as the consumption of tea, coffee, tobacco, food dyes, or tetracycline-like antibiotics.[5,6]

Exogenous discoloration, which typically develops as a result of the consumption of food and beverages throughout the day and is exacerbated by inadequate oral hygiene, can be addressed through the use of toothpaste and mechanical plaque removal procedures. While external discoloration primarily affects the enamel, internal discoloration involves the dentin or the enamel-dentin complex. The most significant causes of internal staining include genetic factors such as amelogenesis imperfecta and dentinogenesis imperfecta, certain blood disorders (e.g., erythroblastosis fetalis, porphyria), aging, trauma, febrile illnesses during dental development, corrosion products from amalgam restorations, improper cleaning of the pulp chamber following endodontic treatment, excessive fluoride intake, or the use of tetracycline derivatives.[6,7]

Most internal discolorations can be effectively treated using bleaching procedures, which have become a routine practice in modern aesthetic dentistry. Tooth whitening is widely regarded as a more conservative alternative compared to prosthetic approaches or composite/porcelain laminate veneer restorations. The principle of tooth whitening lies in the application of chemical agents to the tooth surface, which oxidize organic pigments and thereby lighten the tooth color. Specifically, the oxidizing agents penetrate the spaces between inorganic salts within the tooth structure, react with the organic components, and convert highly pigmented molecules into lighter-colored chains.[8-11]

There are various bleaching techniques designed for both vital and devital teeth, commonly employing hydrogen peroxide (HP), carbamide peroxide (CP) solutions or gels, or ozone gas.[12] In the devital tooth whitening procedure, also known as the 'walking bleach' technique, the primary objective is to achieve color alteration by allowing the bleaching agent, placed in the access cavity following root canal treatment, to diffuse into the dentinal tubules.[5,13]

Among the various methods for whitening vital teeth, office-based whitening performed by a dentist is one of the most preferred options. Additionally, there are at-home bleaching techniques (home bleaching/nightguard bleaching) conducted by the patient under the supervision of a dentist. Over-the-counter bleaching methods, involving products purchased directly from pharmacies or markets without professional consultation or supervision, are also commonly used.[9,15]

Office-based teeth whitening is an effective and scientifically validated method, as it ensures the controlled application of whitening agents by the dentist, protects the soft tissues, and provides clinically acceptable results within a short period. Typically, gel-based products containing 30-38% hydrogen peroxide are utilized. The whitening efficiency increases with the concentration of hydrogen peroxide. Some commercial products contain carbamide peroxide or a combination of hydrogen peroxide and carbamide peroxide. Upon the breakdown of carbamide peroxide, hydrogen peroxide and urea are released.[16,17]

When these oxidizing agents are applied to the tooth surface, they rapidly penetrate both the enamel and dentin, transforming into free radicals. The bleaching process occurs as a result of the reaction between the free radicals and the organic substances that have infiltrated the tooth structure. As the process continues, a point is reached where only hydrophilic, colorless structures remain in the surrounding environment.[18]

CASES

In the medical history of four patients, two male and two female, who presented to the Department of Restorative Dental Treatment at Dicle University Faculty of Dentistry with complaints of tooth discoloration and requests for whitening treatment, various factors were assessed. Upon further questioning, the presence of systemic diseases, history of trauma, medications used, region of residence (with respect to fluoride levels in drinking water), dietary habits, and any previous whitening treatments were explored. Based on the collected information, it was determined that the patients did not have any hereditary diseases, were not using medications, did not smoke, and did not experience pain or sensitivity in their teeth. In intraoral examinations, it was observed that the teeth were vital, free of caries, and the gingival tissues were healthy. No cracks, erosions, or abrasions were observed, and radiographic evaluations revealed no periapical pathology. In light of this information, it was decided to perform whitening treatment in a single session using hydrogen peroxide-based agents, containing 35% to 40% hydrogen peroxide, developed specifically for in-office use. The patients were informed about the treatment plan, and their informed consent was obtained. Intraoral images were captured and recorded before the treatment (prior to plaque removal and oral hygiene education). In all cases, plaque and calculus were removed from the tooth surfaces using a fluoride-free paste. Isolation was achieved by utilizing a lip retractor, cotton pellets, and a saliva ejector. To protect the gingiva from potential bleaching agent leakage, a light-cured resin barrier with a thickness of 1-2 mm and a width of 4-6 mm was applied to cover the cervical area of the teeth by 0.5 mm and polymerized with an LED light source (LED E plus polymerization filling device).

Case 1

In a 34-year-old male patient, a light-cured resin barrier (Dental Dam, Schutz Dental, Germany) was applied to protect the gingiva and polymerized with an LED light source (Figure 1).

Figure 1. Initial photo

Bleaching gel containing 35% hydrogen peroxide (Bleach'n smile automix system, [Schutz Dental, Germany]) was applied to the vestibular surfaces of the teeth to be whitened for 10 minutes at a thickness of 1 mm according to the manufacturer's instructions. After bleaching, the gel on the tooth surfaces was washed away with an air-water syringe. After the teeth were dried, the degree of whitening was found to be insufficient, and the whitening agent was applied for a second time for 10 minutes with the same method. It was washed away again with plenty of water and photographed (Figure 2).

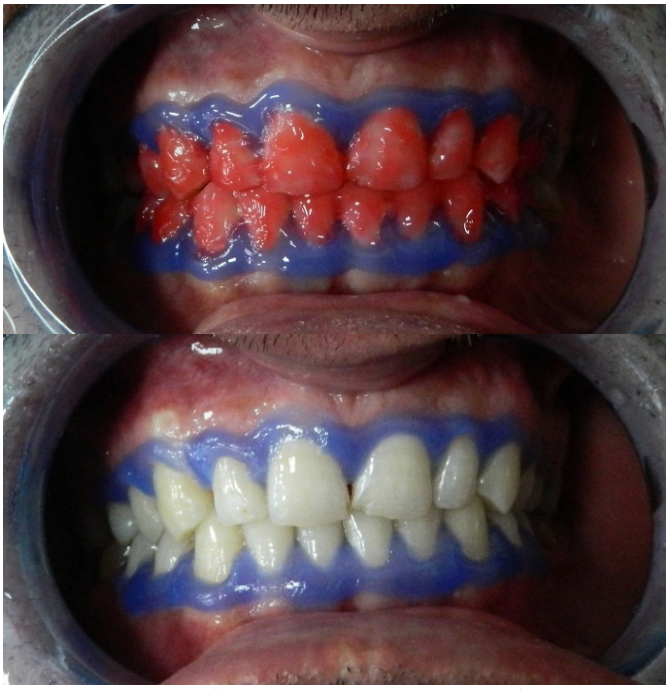

Figure 2. Application of bleaching agent to the teeth and after washing

After the patient expressed her satisfaction, the treatment session was terminated by carefully removing the gingival barrier and applying the desensitizing agent in the kit [after bleaching care gel (Schutz Dental, Germany)] to prevent tooth sensitivity. The patient was informed about avoiding food, beverages and bad habits that may cause discoloration, and an appointment was made for a follow-up visit after 3 months (Figure 3).

Figure 3. Appearance after teeth whitening treatment and 3 months after treatment

Case 2

In the case of a 32-year-old female patient who could not tolerate the lip retractor, we performed the isolation procedure using cotton pellets and saliva absorbent. As described in case 1, a light-cured resin barrier was applied to protect the gums and polymerized with an LED light source (Figure 4).

Figure 4. Initial photograph and application of resin barrier to the gingiva

Bleaching gel containing 35% hydrogen peroxide [Bleach'n smile automix system, (Schutz Dental, Germany)] was applied to the vestibular surfaces of the teeth to be whitened for 10 minutes at a thickness of 1 mm according to the manufacturer's instructions. At the end of the specified time, the bleaching gel was washed away with an air-water syringe and the teeth were dried, and the procedure was terminated after the patient considered the degree of whitening sufficient (Figure 5). Following careful removal of the gingival barrier, the desensitizing agent in the kit was applied to prevent tooth sensitivity. The patient was informed about avoiding food, beverages and bad habits that may cause discoloration, and an appointment was made for a follow-up visit after 3 months (Figure 6).

Figure 5. Whitening agent application and after treatment

Figure 6. Appearance 3 months after treatment

Case 3

In a 37-year-old male patient (Figure 7), a light-cured resin barrier (Opal Dam, Ultradent, USA) was applied to protect the gingiva and polymerized with an LED light source as described in the cases above.

Whitening gel containing 40% hydrogen peroxide (Opalescence Boost, Ultradent, USA) was applied to the vestibular surfaces of the teeth to be whitened for 20 minutes at a thickness of 1 mm according to the manufacturer's instructions (Figure 8).

Figure 7. Initial photo

Figure 8. Application of bleaching agent

After bleaching, the gel on the tooth surfaces was washed away with an air-water syringe. After drying the teeth, the degree of whitening was found to be insufficient, and the whitening agent was applied for 20 minutes for the second time with the same method. It was washed again with plenty of water and removed. At the end of this period, the whitening level was deemed sufficient, and the procedure was terminated. The patient was informed about avoiding food, beverages and bad habits that may cause discoloration, and an appointment was made for a follow-up visit one week later (Figure 9).

Figure 9. Appearance one week after treatment

Case 4

In a 28-year-old female patient, a light-cured resin barrier (Opal Dam, Ultradent, USA) was applied to protect the gingiva and polymerized with an LED light source as described in the cases above (Figure 10).

Whitening gel containing 40% hydrogen peroxide (Opalescence Boost, Ultradent, USA) was applied to the vestibular surfaces of the teeth to be whitened for 20 minutes at a thickness of 1 mm according to the manufacturer's instructions (Figure 11). As in case 3, whitening was found to be insufficient after 20 minutes and the whitening agent was applied for another 20 minutes. After this period, the gel on the tooth surfaces was washed away with the help of an air-water syringe and the whitening level was deemed sufficient and the procedure was terminated.

Figure 10. Initial photo

Figure 11. Application of bleaching agent

The patient was informed about avoiding foods, drinks and bad habits that may cause discoloration again and was advised to come for regular check-ups (Figure 12, 13).

Figure 12. Appearance after treatment

Figure 13. Before and after treatment

DISCUSSION

Nowadays, patients' aesthetic expectations have become as important as pain relief and the restoration of masticatory function. As a result, teeth whitening treatments have become increasingly popular. The efficacy of whitening procedures is influenced by various factors, including the type and severity of discoloration, the patient's age, the concentration of the whitening agents used, and the duration of the treatment. Vital teeth whitening techniques are relatively straightforward, minimally invasive procedures that allow for the alteration of tooth color. These procedures are typically performed through home-based or office-based applications using commercial products containing varying concentrations of hydrogen peroxide (15-40%) or carbamide peroxide (10-22%).[19-21]

The primary reason for the preference of office whitening techniques, which typically utilize high-concentration (35%) hydrogen peroxide-containing products, is their ability to deliver rapid outcomes while ensuring that the procedures remain entirely under the control of the dentist. In office-based applications, whitening efficiency can be achieved within 10-60 minutes, depending on the concentration of the agents used, and the desired effect can be enhanced by incorporating heat or light devices.[24,2]

In our cases, we used hydrogen peroxide in the range of 35-40% without the application of heat or light sources. For the patients in cases 1 and 2, who were concerned about their ability to tolerate whitening agents for extended periods, 35% hydrogen peroxide, Bleach'n smile automix system (Schutz Dental, Germany) material was selected due to its ability to show results more quickly. According to the manufacturer's instructions, the effectiveness of this material is observed rapidly after a 10-minute application. If necessary, a second 10-minute application can also be added. In contrast, for the patients in cases 3 and 4, who had no such concerns and demonstrated better compliance, 40% hydrogen peroxide, Opalescence Boost (Ultradent, USA) was preferred. According to the manufacturer's guidelines, this material is recommended for a 20-minute application, with the treatment being extendable for an additional two or three 20-minute sessions if needed.

As the concentration and application duration of the bleaching agent increase, both the whitening effect and the risk of sensitization rise proportionally. Due to the use of high concentrations of hydrogen peroxide, office-based whitening treatments, which yield more satisfactory results in a shorter time, may cause reversible tooth sensitivity.[26,27]

Patients predisposed to tooth sensitivity should be thoroughly educated and cautioned regarding this potential risk. In cases where conditions such as erosion, abrasion, or gingival recession are present, these issues must be addressed and resolved prior to initiating bleaching procedures.[28]

In home bleaching, color stability can be maintained for a longer duration as the oxidizing molecules penetrate deeper into the tooth structure. However, this method has certain disadvantages, including a longer treatment period (2-6 weeks) compared to office-based whitening procedures, as well as the potential for gingival and tooth sensitivity following the treatment.[22,23]

Although the safety of tooth whitening treatments has been established, studies have reported that these procedures may lead to morphological changes on the enamel surface, increased surface roughness, and reduced surface hardness of restorations.[29,30] Numerous studies have demonstrated that restoration materials are adversely affected by hydrogen peroxide. High concentrations of hydrogen peroxide have been reported to cause chemical degradation in the composite resin matrix, increase surface roughness, decrease surface hardness, and induce cracks. Additionally, carbamide peroxide and its derivatives have been shown to cause oxidation, corrosion, and dissolution, accelerating the deterioration of amalgam restorations and resulting in the release of mercury.[31,32]

Studies have indicated a 25-60% reduction in the bond strength of adhesive restorations immediately following tooth whitening. A study conducted by Türkün et al.[33] reported that composite resin restorations placed two weeks after bleaching exhibited the highest bond strength.

The increase in enamel roughness caused by bleaching agents makes teeth more susceptible to external staining. For these reasons, it is recommended to apply bleaching agents for the durations specified by the manufacturers. During the bleaching procedures conducted in accordance with the manufacturer's guidelines, no sensitivity issues were observed in our patients. Nevertheless, remineralizing agents were applied to all teeth to prevent subsequent dentin sensitivity.

An additional critical criterion for success in vital teeth whitening treatments is patient satisfaction and the stability of the achieved color. In the cases we treated, an acceptable whitening effect and patient satisfaction were attained in a single session, and follow-up assessments revealed that the teeth maintained their color.

CONCLUSION

The key to success in teeth whitening treatments lies in selecting techniques and materials that are appropriate for the specific case, meeting patient expectations, and providing patients with adequate information about the treatment process and outcomes. The vital teeth whitening method, when an appropriate treatment plan is established, should be preferred as it offers rapid results in a short time, ensures patient satisfaction, and is relatively simple and safe compared to other treatment options.

ETHICAL DECLARATIONS

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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