

## Case Report

## Minimally invasive teeth whitening enhancements after orthodontic treatment with in-office bleaching: two case reports

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### ABSTRACT

**Background:** Teeth discoloration is one of the adverse effects of orthodontic treatment which causes aesthetic issues that effect on a person's appearance. The management of teeth discoloration can be done with bleaching because it is easier to perform, faster, more effective, and more conservative than other treatments such as crowns and veneers. There are two types of bleaching techniques supervised by dentists: home bleaching and in-office bleaching. In-office bleaching is one of the most conservative and non-invasive treatment options to restore the aesthetics of discolored teeth. **Purpose:** This case report observes management of tooth discoloration after orthodontic treatment with in office bleaching using hydrogen peroxide 40%. **Case 1:** A 24-year-old woman came to Universitas Hasanuddin Dental and Oral Hospital with complaints of yellowish upper and lower teeth after removal of her fixed orthodontic appliance. **Case 2:** A 24 years old woman came to Universitas Hasanuddin Dental and Oral Hospital with complaints of upper and lower front teeth appearing yellowish in color, noticed from 2 years ago and had undergone orthodontic treatment for four years. **Case Management:** From clinical examination, both patients' teeth have no history of caries, sensitive tooth and gingival recession. The Teeth were sensitive to vitality test. The discoloration was treated with external bleaching using 40% hydrogen peroxide. **Conclusion:** External Bleaching using 40% hydrogen peroxide have results in significant discoloration without changing the shape and arrangement of the patient's teeth.

**Keywords:** home bleaching, in-office bleaching, orthodontic treatment, teeth discoloration

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### INTRODUCTION

Tooth discoloration is an aesthetic problem that can affect a person's appearance. Discolored teeth, especially on the anterior teeth, can cause a person to feel uncomfortable and insecure when speaking or smiling. Smiling is an important component of facial attractiveness in human interactions. Therefore, the self-perception of the aesthetics of the smile is influenced by the gingiva and teeth in terms of size, position, shape, and colour.<sup>1-3</sup>

The etiology of teeth discoloration is multifactorial and can occur extrinsically, intrinsically, or in a combination of both.<sup>4</sup> Chromogens produced by organic compounds in diet and smoking are the most common causes of extrinsic changes in tooth colour.<sup>2</sup> Teeth discoloration are also considered a side effect of orthodontic treatment and induced by the acid etching process, which makes the teeth susceptible to discoloration. Often, prolonged corrosion of orthodontic bracket metal and low oral pH in some patients also cause discolored teeth, so consumption of colored foods and drinks should be minimized during orthodontic

treatment. The process of removing the adhesive material can cause teeth discoloration after the debonding of fixed orthodontic appliances because during the procedure it is sometimes done by roughening the enamel surface or by leaving some adhesive material on the teeth surface, which is very susceptible to absorbing stains.<sup>2,3</sup>

The management of teeth discoloration can be done in several ways, namely micro abrasion of enamel, bleaching, veneers, and crowns. Currently, aesthetic dentistry seeks to treat teeth discoloration with minimally invasive treatment methods, such as bleaching. Bleaching is the treatment of choice for most teeth discolorations because it is easier to perform, faster, more effective, and more conservative than other treatments such as crowns and veneers.<sup>3,4</sup>

There are two types of bleaching techniques supervised by dentists: home bleaching and in-office bleaching. Even though home bleaching is the treatment of choice for vital teeth, sometimes patients don't want to use the bleaching tray every day for several weeks, so they prefer treatment with in-office bleaching techniques, which provide faster results. The advantages of the in-office bleaching technique

include the bleaching procedure is faster, there are minimal risk factors because it is performed by a dentist and tooth sensitivity after the bleaching procedure can be reduced by using a desensitizing agent containing potassium nitrate and sodium fluoride. The disadvantages of this technique include the in-office bleaching procedure is relatively more expensive compared to other techniques and the results are unpredictable, depending on several other factors such as age, type of stain, and others.<sup>3,4</sup>

orthodontic appliance. The patient wants to whiten her teeth. The patient has a habit of consuming coffee at least five times a week. After carrying out a clinical examination, the teeth were vital, with no history of caries, gingival recession and sensitive teeth (Figure 1).

The diagnosis of the clinical condition of the patient's teeth is tooth discoloration. The treatment plan for the patient's teeth is an in-office bleaching procedure using hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) at a concentration of 40%.

### CASE 1

A 24 years old woman came to Universitas Hasanuddin Dental and Oral Hospital with a chief complaint of yellowish of her upper and lower teeth after removal of her fixed

### CASE 2

A 24 years old woman came to Universitas Hasanuddin Dental and Oral Hospital with a chief complaint of upper and lower front teeth appearing yellowish in shade,

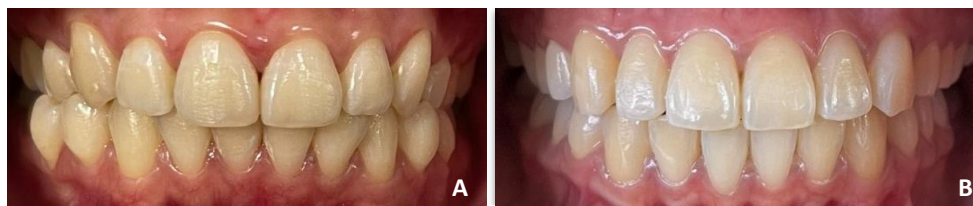


Figure 1. Initial clinical appearance: (A) Case 1 and (B) Case 2.



Figure 2. (A) Brushing with pumice; (B) Initial shade determination; (C) Application of astringent agents; (D) Application of gingival barrier; (E) Application of H<sub>2</sub>O<sub>2</sub> 40%; (F) Removal of gingival barrier; (G) Final color determination; (H) Application of desensitizing agent.

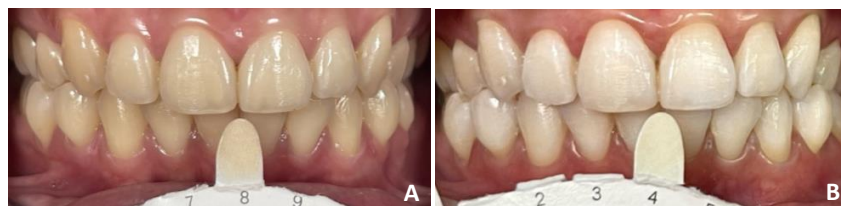
noticed from 2 years ago. The patient had undergone orthodontic treatment for four years. The patient has a habit of consuming tea every morning. The patient feels less confident, and wants to whiten his teeth. Intra-oral examination showed yellowish maxillary and mandibular teeth, healthy periodontal tissue, no gingival recession and caries (Figure 1). Tooth vitality test reacts to cold. From the results of the anamnesis, the patient did not have a history of sensitive teeth. The treatment plan is external bleaching.

### CASE MANAGEMENT 1

Both patients were given communication, information, education and informed consent before undergoing the treatment procedure. The teeth's surfaces were cleaned

with pumice and brush. Determine the initial color of the patient's teeth (No. 8, shade guide Opalescent Boost, Ultradent). Protective lip balm was applied first, then the soft tissue (lips and cheeks) was isolated using a cheek retractor (Optragate) and a bite block (Isoblock, Ultradent). An astringent agent (Expasyl, Acteon) was applied into the gingival sulcus.

Gingival barrier (Opaldam, Ultradent) was applied to the entire surface of the gingival margin, gingiva and proximal anterior teeth to the premolars on the maxillary and mandibular then light cured for 20 seconds with a scanning motion. After ensuring the gingival barrier was not leaked, 40% H<sub>2</sub>O<sub>2</sub> bleaching agent (Opalescence Boost) was applied for 20 minutes per cycle. The application of bleaching agent is carried out for up to two cycles. After that, the bleaching agents was cleaned and the gingival barrier was



**Figure 3.** Clinical Appearance: (A) Before and (B) After Bleaching Treatment.



**Figure 4.** (A) Brushing with pumice; (B) Initial shade determination; (C) Application of astringent agents; (D) Application of gingival barrier; (E) Application of H<sub>2</sub>O<sub>2</sub> 40%; (F) Removal of gingival barrier; (G) Final color determination; (H) Application of desensitizing agent.

removed. Then the color of the teeth was determined after two cycles of the bleaching procedure (No. 4, Shade Guide Opalescent Boost). A desensitizer containing potassium nitrate and sodium fluoride (UltraEZ) was applied. The procedure is shown in Figure 2. After all procedures have been completed, post-care instructions were given, which include avoiding colored foods and drinks such as coffee for 24-48 hours, maintaining oral hygiene, and performing regular check-ups.

At the next visit (7 days after the bleaching procedure), the patient was instructed to come back for control. There were no patient complaints. Extra oral and intra oral examination showed normal soft tissue around the teeth. The teeth color remained unchanged (No.4, shade guide Opalescent Boost) and the patient was satisfied with the result (Figure 3).

## CASE MANAGEMENT 2

Prior to treatment, the patient was given communication, information, education regarding oral health, and informed consent. The tooth surface was cleaned with a brush and pumice. The initial color of teeth was determined No. 8, using the Shade Guide from Opalescence Boost, Ultradent. Protective lip balm was applied, followed by Optragate and Isoblock, teeth were dried and astringent agent (Expasyl, Acteon) was applied to the gingiva for 2 minutes. The teeth were cleaned and dried and a gingival barrier (Opaldam, Ultradent) was applied to the gingiva and proximal teeth with a thickness of 1-2 mm, a width of 4-6 mm and overlaps the teeth of 0.5 mm, then light cured for 20 seconds with scanning motion. Application of 40% H<sub>2</sub>O<sub>2</sub> bleaching agents (Opalescence Boost) was done on teeth. Then, the teeth were cleaned of bleaching material using high suction and the gingival barrier was removed.

Improvement in teeth color was obtained after the second application of bleaching agent into No. 4 after the second application using the Shade Guide Opalescence Boost, Ultradent. Then a desensitizing agent containing 3% potassium nitrate and 0.11% sodium fluoride (UltraEZ, Ultradent) was applied for 15 minutes. The procedure is shown in Figure 4. The patient was instructed to avoid colored foods and drinks for 24-48 hours after treatment, maintain oral hygiene, and back for control 1 week after treatment. Appearance after bleaching treatment is shown in Figure 5.

## DISCUSSION

The etiology of tooth discoloration must be carefully assessed in order to predict how much bleaching procedure will lighten teeth. Discoloration can be caused by extrinsic and intrinsic stains. Extrinsic stains can be classified into two categories: direct stains, which are caused by tea, coffee, other drinks, cigarettes which are characterized by discolored teeth turning brown-blackish, yellow-brown and black, and indirect stains, which are caused by plaque or poor oral hygiene, polyvalent metal salts, and cationic antiseptics (chlorhexidine), which are characterized by discolored teeth that turn yellow, brown and black.<sup>1,3,5</sup>

Treatment with fixed orthodontic appliances has become dominant in orthodontic practice worldwide. However, since the introduction and use of the acid etching technique for orthodontic bracket bonding, restoring the enamel surface as close to its original state as possible with a minimum amount of enamel loss at the end of treatment has become a major concern. Enamel structure which absorbs the color and corrosion of orthodontic instruments. This shows that the type, depth of penetration reaches 50µm and the chemical composition of the resin tag plays an important role in the occurrence of discoloration in the enamel.<sup>2,4,5</sup>

Bonding, debonding, and cleaning procedures can cause changes in enamel such as loss of enamel caused by etching, decalcification, and enamel surface roughness. In addition to structural defects, attention should also be paid to adverse effects on tooth discoloration and enamel esthetics.<sup>3,5</sup>

Extrinsic stains tend to form usually in tooth areas that cannot be cleaned with a toothbrush related to the presence of fixed orthodontic devices with bad habits such as smoking, chewing tobacco, intake of foods rich in tannins e.g., red wine, tea, coffee). Extrinsic stains can be removed. through in-office and at-home bleaching techniques. Joiner et al, a recent literature review on tooth bleaching, it was confirmed that in-office bleaching with higher concentrations of bleaching agents can shorten the working time.<sup>1,5,4</sup>

Bleaching is the first choice because it provides good aesthetic results, minimally invasive, relatively safe, and effective. In addition, bleaching has side effects on tooth structure such as changes in surface roughness and decreased microhardness, which can cause demineralization of the tooth surface. Saliva plays an important role in overcoming these side effects for the remineralization process.<sup>1,2</sup>



**Figure 5.** Clinical appearance (A) Before and (B) After bleaching treatment.

The mechanism of action of bleaching agents is based on the release of the active form of oxygen, through the interaction of H<sub>2</sub>O<sub>2</sub> with tooth structure. H<sub>2</sub>O<sub>2</sub> is a strong oxidizing agent capable of producing free radicals, releasing oxygen (O<sub>2</sub>), reducing complex carbon chains of pigments or chromogens to smaller molecules with free hydroxyl and thereby giving a brighter effect.<sup>4,5</sup>

Various brands of bleaching agents with various concentrations are available in the market. In this case report, we performed an external bleaching procedure with an in-office bleaching technique using Opalescent Boost containing 40% H<sub>2</sub>O<sub>2</sub>. This technique is effective in shortening treatment time for patients and dentists, while still providing optimal results. This is in line with previous research that bleaching can lighten the color of the teeth of patients who experience discoloration after using fixed orthodontic devices various brands of bleaching agents with various concentrations available on the market. In this case report, we performed an external bleaching procedure with an in-office bleaching technique using Opalescent Boost containing 40% H<sub>2</sub>O<sub>2</sub>. This technique is effective in shortening treatment time for patients and dentists, while still providing optimal discoloration results. This is in line with previous research that bleaching can lighten the color of the teeth of patients who experience discoloration after using fixed orthodontic devices.<sup>2,4</sup>

The emergence of tooth sensitivity after the procedure is considered a bad effect of bleaching treatment, which is caused by the diffusion of by-products produced by H<sub>2</sub>O<sub>2</sub> to the dentinal tubules. In in vivo studies by Cohen and Robertson, it was explained that the pulp contains peroxidase and catalase enzymes. which can provide protection against bleaching agents by degrading H<sub>2</sub>O<sub>2</sub> molecules. In addition, Opalescent Boost 40% H<sub>2</sub>O<sub>2</sub> contains a desensitizer consisting of potassium nitrate and sodium fluoride, so that patient sensitivity after the bleaching procedure is very low.<sup>1,2,4</sup>

Based on the results observed in these two case reports, when selecting recommended bleaching technique, it

would be prudent for the dentist to use techniques that is as effective as possible to achieve the patient's expectations, but with minimal side effects, i.e. in-office bleaching, which is the most common technique, simple and economical way to transform a patient's smile.

In conclusion, the use of fixed orthodontic appliances and the habit of consuming colored food or drinks, in this case coffee, can result in tooth discoloration due to extrinsic stains. The choice of in-office bleaching procedure is able to provide optimal discoloration results on discolored teeth with a more conservative procedure if done with the right procedure.

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