

## Bleaching of non-vital teeth, five-year follow-up: case reports

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### Abstract

In 2009, a study was conducted for the purpose of comparing the effectiveness of two bleaching agents: sodium perborate and 37% carbamideperoxide gel. Thirteen patients diagnosed with “non-vital teeth with traumatic dyschromias” were treated at the Universidad Autónoma de Santo Domingo School of Dentistry, Dominican Republic. The findings showed that both bleaching agents were effective; however, 37% carbamideperoxide worked more rapidly and was easier to administer. Because it comes in individualised pre-measured syringes, the gel is immediately ready for application, thereby giving patients the results they desire in a considerably shorter amount of time.

After five years, the 13 patients previously treated with the non-vital dental bleaching products were recalled to be re-evaluated for possible reversal of tooth discolouration and the development of cervical resorption. Only four patients came to this follow-up dental visit. In all four of the patients’ radiographic findings, there was a complete absence of external cervical resorption. Three of the patients had reversal of tooth discolouration; however, for one patient there were no observable dyschromias. Regardless of the bleaching agent used, if the patient had poor final dental restoration(s) post-bleaching procedure and a lifestyle counter to the maintenance of proper dental health (i.e. smoking, excessive alcohol consumption, and excessive simple sugar consumption), the dyschromias tended to return.

**Keywords:** Internal tooth bleaching; Walking bleach; Cervical resorption.

### Introduction

Tooth dyschromias constitute a clinically visible deviation from the normal dental colour.<sup>(2,3)</sup> This creates an aesthetic problem that can become a great concern for patients. Dental dyschromias are classified as either:

- intrinsic, a consequence of the administration of drugs, progressive dystrophies, the physiological process of aging, iatrogenic factors, traumatic factors, pulp or certain systemic afflictions; or
- extrinsic, which affect the external surfaces of teeth and may be the result of habits, diet, or both.<sup>(1)</sup>

Dental bleaching is one of the alternatives used today to improve the aesthetics of discoloured teeth. It is considered a conservative clinical approach, where a chemical solution or bleaching agent is applied to the surface or the interior of the tooth. Non-vital or internal tooth-bleaching is used to lighten a discoloured tooth that previously received root canal therapy. The procedure involves placement of a chemical oxidising agent within the interior portion of a tooth to remove discolouration.<sup>(3,4)</sup> Today’s market offers a variety of bleaching agents for tooth-whitening. Of these, sodium perborate, also called perboric acid, is the most trusted among dentists for use as an internal bleaching agent, due to excellent results and its respect for the periodontal tissues. Carbamine peroxide, also called urea peroxide, is also widely used in dentistry for external dental bleaching.

This article describes the findings five years after administration of the “walking bleach” technique treatment, with the bleaching agents sodium perborate + distilled water and 37% peroxide carbamide.

### Materials and Method

Forty-five volunteer patient’s attending the Endodontic Department at the School of Dentistry, Universidad Autónoma de Santo Domingo (Autonomous University of Santo Domingo), participated in this study. Their chief complaint was the presence of a tooth with a darker shade than that of their other teeth. When asked, all the patients revealed a history of dental trauma and were diagnosed with “non-vital teeth with traumatic dyschromias”.<sup>(1)</sup>

After meticulous evaluation, 13 patients met the requirements to participate in this investigation. Two of these patients had more than one tooth that was treated and were counted twice, making a total of 15 treatments. The 15 endodontically treated anterior maxillary teeth were subjected to internal bleaching by the “walking bleach” technique.

The 15 teeth to be treated were divided into three groups:

- Group A, where sodium perborate + distilled water were placed and changed every seven days with a total of 3-4 sessions.
- Group B, where 37% carbamideperoxide gel was placed and changed every seven days with a total of 3-4 sessions.
- Group C, where 37% carbamideperoxide gel was placed and changed every four days with a total of 3-4 sessions.

The procedures for groups A and C followed the manufacturer’s instructions.<sup>(1)</sup>

### Bleaching technique protocol

1. Diagnosis and treatment planning.

2. Prophylaxis, registrations of initial tooth colour according to the VITA colour guide, and the acquisition of initial images.<sup>(1,2)</sup>
3. Tooth isolation to protect adjacent structures from the bleaching agent.
4. Reshaping of the access cavity, so the pulp horns or other "hidden" areas can be properly exposed and cleaned.
5. Reduction of the root filling by approximately 3mm in an apical direction from the clinical crown height, to generate space for the application of a cervical sealed material, and to expose dentinal tubules for the application of the bleaching agent.
6. Application of a mechanical cervical seal (double barrier) in the form of a 1mm Coltisol cap, with a layer of light-curing glass-ionomer cement placed upon it, to minimise leakage of the bleaching agents.<sup>(7,8,9,11)</sup>
7. Acid conditioning with 37% phosphoric acid for 30 seconds to remove the smear layer and to open the dentinal tubules.
8. Application of the bleaching agent. In Group A, the sodium perborate was triturated in a glass-mixing slab, and distilled water was added until this mix became homogeneous. This mixture was added to the pulp chamber without touching the sidewalls, leaving enough space to restore the lingual access.<sup>(4)</sup> For Groups B and C, 37% carbamideperoxide gel was applied to the pulp chamber without touching the sides, leaving enough space to restore the lingual access.<sup>(5)</sup>
9. Temporary filling with Coltisol.<sup>(1,7,10)</sup>
10. Occlusal adjustment.

**Follow-up appointments:** Each treated tooth was evaluated, and the results were recorded according to the VITA colour guide. Subsequently, the teeth were photographed to capture the sequence of colour changes. The results obtained were registered, and stages 8, 9, and 10 of the first appointment explained above were repeated, with a limit of 4 sessions per patient.

When the tooth reached the desired colour or bleaching limit, the temporary filling was removed, and the pulp chamber was irrigated with water to eliminate the bleaching agent, a process that was necessary for groups B and C to allow for the placement of a calcium hydroxide paste and water, which remained there for 10 days to neutralise pH. After 10 days, the calcium hydroxide was removed, and the clinician proceeded to the final restoration with resin composite applied by the oblique incremental technique, with care taken to prevent premature occlusal contact.<sup>(1,2,6,9)</sup>

All the information obtained for this study was recorded on two cards created for the purpose: a

"Clinical Card", on which the initial diagnosis was recorded; and a "Control Bleaching Card", used to record initial colour and subsequent colour changes obtained at each bleaching session.<sup>(1)</sup>

## Results

**Five-year follow-up methods:** After five years, the 13 patients previously treated with the non-vital dental bleaching products were recalled for evaluation to assess their periodontal health and the possible presence of cervical tooth resorption, which was a risk explained to them before the procedure. Only four patients came to this follow-up dental visit at the Endodontic Department of the School of Dentistry of the Universidad Autónoma de Santo Domingo, Dominican Republic.

### Steps to follow during the procedure

1. Clinical Card preparation: Update the patient's personal and clinical information. The patient is informed about the characteristics and duration of the procedure.
2. Form for recording toxic habits: This was prepared to collect information about possible toxic habits that could be related to the production of dyschromias.
3. Photograph to record the clinical state of the tooth that had previously received treatment.
4. X-ray to evaluate the presence or absence of cervical root resorption on the treated tooth.
5. Referral and final recommendations to offer the patient additional treatment if needed.

### Clinical case 1



Before: Tooth 9 with colour A4



Five-year follow-up:  
Tooth 9 with colour A2



Later: 4<sup>th</sup> session, colour A2



X-ray evaluation at five-year follow-up



Later:  
Tooth 7 with colour A1  
Tooth 8 with colour A2



X-ray evaluation at five-year follow-up.

**Clinical case 2**



Before: Teeth 7 & 8 with colour A3



Five-year follow-up:  
Teeth 7 & 8 with colour A3

**Discussion**

This case study shows that use of the ‘walking bleach’ technique for the management of discoloured endodontically treated teeth can be safely done whilst adhering to the proper barrier placement methods, thereby preventing resorption, as reported previously.

The bleached tooth in the first clinical case preserved the desired aesthetic colour, even though the patient reported occasionally drinking coffee and smoking; however, the final restoration made after the internal bleaching was in perfect condition. Not so in the second, third, and fourth clinical cases, where the restorations were defective and regression of the dyschromias was observed, although in these cases the patients reported the absence of habits like smoking and coffee consumption.

Previous investigators have suggested that the internal tooth bleaching procedure would have to be repeated to maintain the desired esthetic colour. In 1981, Howell<sup>(12)</sup> reported the results of an in vivo study showing that 50% of the teeth subjected to internal bleaching experienced a regression of the dyschromias after one year. In 1992, Fasanaro<sup>(13)</sup> suggested that the treatment should be repeated every two years. In 1991, Albers<sup>(14)</sup> reported longevity of three years for internal dental bleaching with hydrogen peroxide and sodium perborate. However, this study found that to determine the precise time for repetition of the bleaching treatment,

yearly evaluation of the patients would be needed. Furthermore, the length of time between bleaching procedures depends greatly on: correct final rehabilitation after the internal dental bleaching, the patient's follow-up visit with his/her dental health care provider, and patient care at home.

### Conclusions

In this follow-up study, four cases of non-vital tooth bleaching were re-evaluated. It was found, as explained by previous authors, that dyschromias tend to return after non-vital tooth bleaching.<sup>(2,3)</sup> To maintain an ideal or aesthetic dental colour, the bleaching procedure must be repeated.

Our study showed that management of discoloured endodontically treated teeth with the 'walking bleach' technique could be safe. Nevertheless, patients must be alerted to the potential, albeit minor, risk of cervical resorption. When the non-vital bleaching treatment is performed correctly, it can be used as an effective and safe post-endodontic treatment for discoloured anterior teeth.

The longevity of non-vital bleaching is directly related to: the quality of the final rehabilitation after the internal dental bleaching treatment, the quality of patient care at home, and the patient's commitment to keep follow-up appointments with the dental care provider.

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