

Management of trauma-induced discoloration in non-vital teeth using walking bleach technique: A case series

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ABSTRACT

An aesthetic smile is important since it influences a person's psychosocial well-being and shapes the image of their aesthetic self. Non-vital tooth discoloration can be caused by several factors, the most frequent, however, are dental trauma and residual sealing materials in the pulp chamber following root canal treatment. Internal bleaching (Walking bleach or Thermocatalytic) is a minimally invasive alternative to veneers or crowns. This case series presents the management of trauma-induced discoloration in anterior teeth using the walking bleach technique. Patients reported with a chief complaint of discolored front teeth and their history revealed dental trauma. After the clinical and radiographic examination, endodontic therapy was performed. After recording the shade, the walking bleach technique was performed and the patients were recalled subsequently at weekly intervals, depending on the severity of discoloration. Further bleaching appointments were scheduled if needed. After obtaining a satisfactory improvement in the shade, a definite restoration was done. Conclusion: Proper case selection and patient education can lead to satisfactory outcomes. The walking-bleach technique is recommended as a safe alternative for treating discolored non-vital teeth.

Key words: Dental trauma, Tooth discoloration, Bleaching agents, Non-vital teeth, Walking bleach technique

Recently, patients' primary concerns have shifted to having a pleasant smile as smiling plays an important role in social interaction [1]. Discoloration of the teeth and gums can be among the many conditions that can affect a beautiful smile. In erupted teeth, tooth trauma or endodontic therapy is often linked to tooth discoloration of non-developmental origin. Dental trauma can cause hemorrhage by interrupting the neurovascular supply to the pulp [2]. Discoloration surrounding the dentin is caused by hemoglobin and other hemein compounds accumulating in the dentinal tubules [3]. Iron is released in conjunction with hemolysis of erythrocytes in the dentin tubules. Iron interacts with hydrogen sulfate generating ferric sulfide, a black chemical that causes tooth discoloration. Similarly,

discoloration can also occur if the pulp remnants or the root canal obturating material is not completely removed during endodontic therapy [2]. In non-vital teeth, although there are various internal tooth-whitening methods; the walking-bleach method is the most widely used [1]. The walking bleach technique is a conservative, minimally invasive, easy-to-use, inexpensive, and effective technique in the management of discoloration due to trauma or endodontic therapy [4]. The present case series reports the management of non-vital discolored maxillary anterior teeth using the intra-coronal walking-bleach technique.

CASE SERIES

Case Report 1

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A 67-year-old male patient reported with a discolored front tooth for 1 year (**Figure 1A**). History revealed trauma due to a fall 15 years back. On examination, tooth 11 was fractured, discolored, along with no tenderness on percussion (Ellis class IV) and, Ellis class II fracture was noted in tooth #21. Radiographically, apical widening was noted in #11 (**Figure 1B**). A diagnosis of pulp necrosis with asymptomatic apical periodontitis was established. Following non-surgical endodontic treatment, (**Figure 1C**), the coronal discoloration was managed by the "walking bleaching" technique as described below.

Steps in non-vital bleaching:

Informed consent was obtained after explaining the bleaching procedure, the number of visits, cost, side effects, possible outcomes, failures, and complications. The pre-operative shade of the tooth was recorded with a VITA shade guide. Under the rubber dam isolation, the Gutta percha was reduced 2 mm below the cemento-enamel junction. An intra-coronal cervical barrier of zinc-phosphate cement (Harvard cement, Harvard Dental International GmbH, Germany) was placed. The labial wall of the pulp chamber was etched for 10 seconds with 37% phosphoric acid (Ivoclar Vivadent, Schaan, Liechtenstein) and rinsed with water (**Figure 1D**). Sodium perborate (Nice Chemicals (P) Ltd. Kerala) powder was mixed with 30% hydrogen peroxide solution (Qualikems Lifesciences Pvt. Ltd. Gujarat) and was placed in the pulp chamber (**Figure 1E**). The access cavity was then temporarily sealed with zinc phosphate (Harvard cement, Germany). On 1-week follow-up visit, the patient reported satisfactory improvement, which was confirmed with the Vita shade guide (**Figure 1F**). The access cavity was restored with cavitec (3M ESPE, Bayern, Germany) and 2 weeks later a definite restoration was done with composite resin. (Ivoclar Vivadent, Schaan, Liechtenstein).

Case Report 2

A 34-year-old male patient reported the chief complaint of pain in the upper front tooth region for two months. History revealed, a fall 5 years back. Intraoral examination revealed a discolored right lateral incisor (tooth #12) with Ellis class I fracture of the disto-incisal angle (**Figure 1G**). The pulp vitality test was negative and the tooth was tender to percussion. No swelling or sinus opening was noted and the periodontal probing was within normal limits. Radiographic examination revealed periapical radiolucency (**Figure 1H**). The vitality of adjacent teeth

was within normal limits. A provisional diagnosis of pulp necrosis with apical periodontitis was established. After non-surgical endodontic treatment, the coronal discoloration was managed by the "walking bleaching" technique, as described above (**Figure 1I**).

Case Report 3

A 23-year-old male patient reported a chief complaint of the discolored front tooth (**Figure 2A**). The patient reported a history of fall 2 years back. On examination, tooth #11, was discolored, and non-tender on percussion or palpation (Ellis class IV). Radiographic examination revealed a periapical radiolucency in #11 (**Figure 2B(i)**). A diagnosis of chronic apical periodontitis was established. After informed consent, non-surgical endodontic treatment was completed (**Figure 2B(ii)**) and non-vital walking bleach was performed. After satisfactory shade change was noted, the definite composite restoration was done after 2 weeks (**Figure 2C**).

Case Report 4

A 32-year-old female patient reported a chief complaint of pain in upper front teeth associated with discoloration (**Figure 2D**). Pain was dull and intermittent in nature. The patient reported a history of childhood trauma. On examination, tooth #11, was discolored and tender on percussion (Ellis class IV). Pulp vitality revealed no response in #11 and 12. Radiographic examination revealed a periapical radiolucency involving #11 and #12, with calcification in #12 (**Figure 2E(i)**). A diagnosis of chronic apical periodontitis was established. After completing the endodontic treatment, (**Figure 2E(ii)**) the non-vital walking bleach was performed, and following satisfactory shade change, the definite composite restoration was done (**Figure 2F**).

Case Report 5

A 35-year-old male patient reported a chief complaint of broken upper front teeth associated with discoloration (**Figure 2G**). Past history revealed a fall for which he had undergone endodontic treatment 6 months back. Clinical examination revealed Ellis class III fracture with discoloration in tooth #11. Ellis class II fracture was noted in tooth #21 with positive pulp vitality. A radiographic examination revealed a satisfactory obturation (**Figure 2H**). Non-vital bleaching was done in tooth #11, followed by Composite restoration after 2 weeks (**Figure 2I**).

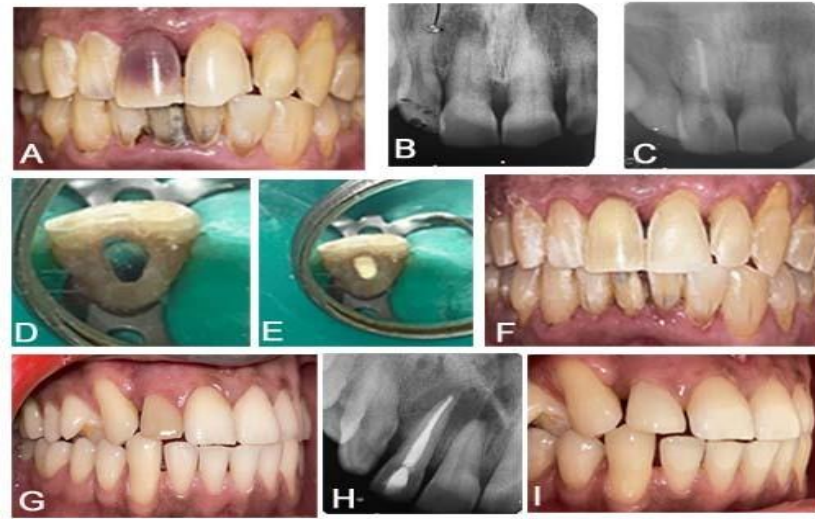


Figure 1: (Case 1: A-F). A. Pre-operative view, B. Pre-operative IOPAR, C. Post-endodontic IOPAR, D. Acid-etch with 37% Phosphoric acid in pulp chamber, E. Placement of Bleaching agent (sodium perborate + 30% Hydrogen peroxide) in pulp chamber, F. Post-bleaching clinical photograph. G. Case 2, Pre-operative view, H. Pre-operative IOPAR and I. Post-bleaching clinical photograph. (IOPAR: Intra-oral periapical radiograph)



Figure 2: Clinical and Radiographic images. Case 3 (A-C), Case 4 (D-F) and Case 5 (G-I)

DISCUSSION

The "walking" bleach technique was developed by Nutting and Poe, who recommended 30% hydrogen peroxide along with sodium perborate [5]. Howell found that by acid-etching the dentin, the bleaching agent was able to penetrate deeper into the dentinal tubules [6]. Unlike, the thermo-catalytic inside bleaching method which uses a heat source to increase the reactive oxygen species release, the walking-bleach technique is a no-heat approach. Hence, the periodontal tissue damage and root resorption are minimized [2,4].

The most commonly used bleaching agent in the walking bleach technique is sodium perborate [2]. However, 35%

carbamide peroxide and 35% hydrogen peroxide are also being used. These agents encourage oxidative reactions to reverse the chromatic change [7]. Sodium perborate is available in powder form and breaks down into sodium metaborate, hydrogen peroxide, and nascent oxygen [8]. Several studies have concluded that the efficacy of using hydrogen peroxide, carbamide peroxide, or hydrogen peroxide combined with sodium perborate, and found to be better than using sodium perborate alone [9].

According to Knezevic et al., bleaching older discolorations was unpredictable and frequently ineffective because the dentin integrates color more intricately. In contrast, bleaching teeth that have been discolored for a shorter period of time (less than 5 years)

have a better chance of success [10]. One unfavorable effect of internal bleaching is cervical root resorption, which has been linked to excessive hydrogen peroxide leaking into the periradicular tissues, possibly via cement defects, though the exact mechanism is yet unknown [11]. Studies suggest there is a reversible decrease in the bond strength of composite resin to the tooth structure following bleaching and this is attributed to a delayed oxygen release that interferes with resin polymerization. Hence, delaying the post-endodontic adhesive restoration by 1-3 weeks is recommended [12].

CONCLUSION

There is a lack of awareness among the patients regarding the non-vital bleaching procedure. While several treatment options are available, non-vital bleaching offers a minimally invasive, aesthetic treatment in the management of trauma-induced discolorations.

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