



CASE REPORT

Non-Vital Internal Tooth Bleaching using 35% Hydrogen Peroxide Gel: A Case Report

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Abstract

Tooth discolouration affects esthetics and has a psychological impact on self-confidence and behaviour. Treatment modalities include polishing and bleaching. The purpose of this case report was to document the effect of walking bleach method using 35% hydrogen peroxide on esthetics, surrounding tissue. and psychological impact.

A 39-year-old female patient reported with a discolored maxillary left central incisor. On examination, the tooth was asymptomatic and exhibited tooth discoloration. Radiographic findings indicated an acceptable root canal treatment. On the first visit, the tooth shade of the tooth was D3. Composite occluding the pulp chamber and 3 mm of the cervical radicular filling were then removed to allow for placement of a protective barrier. Then, 35% hydrogen peroxide was placed, and the cavity was sealed. The patient was recalled after five days and the change in shade of the tooth was recorded as A1. The bleaching agent was irrigated and flushed off the pulp chamber and the cavity was permanently filled with composite restoration. Recall sessions were scheduled at 1 & 4 months.

In conclusion, management of non-vital tooth discoloration with the walking bleach method using 35% hydrogen peroxide was effective, safe, and had a positive impact on the patient's self-confidence and self-perception.

Keywords: Hydroperoxide, Tooth Bleaching, Tooth Discolorations, Walking Bleach Technique

Introduction

Tooth discoloration affects esthetics and has a psychological impact related to self-confidence and behaviour which becomes even more prominent when only a single tooth is discolored.¹ Discoloration could occur during the formative stages due to genetic reasons or medication induced such as excessive fluoride intake or administration

of tetracycline. When discoloration occurs post eruption, the causes may be extrinsic resulting from bad oral hygiene or poor oral habits such as smoking, excessive intake of coffee, wine, or carbonated drinks,² In case of intrinsic staining, causative factors could be pulp necrosis and breakdown of pulp material. Discolouration may also be iatrogenic or related to the filling material

used coronally like amalgam or radicularly with some types of sealers and obturation material when root canal treatment is done.²

Different treatment modalities have been recommended depending on the severity, location, size, causes, and extent of the discoloration: Non-invasive techniques include scaling & polishing, vital teeth external bleaching using agents through chemical and/or thermo-catalytic reaction done in office or using pre-loaded trays or night guards used at home.³ Non-vital teeth internal bleaching was also recommended for root canal treated teeth.^{3,4} Minimally invasive techniques include macro-abrasion using resin infiltration and spot removal of deep stains, micro-abrasion involving the use of acidic and abrasive agents applied to the altered enamel surface with mechanical pressure from a rubber cup coupled to a rotatory mandrel of a low rotation micromotor. Invasive techniques include composite or porcelain veneers that involves extensive reduction of labial enamel.³⁻⁵

In 1961 Spasser introduced the walking bleach method which involved removal of filling material from the pulp chamber and adding a bleaching agent, then sealing it off and leaving it for few days, the procedure could be repeated until the desired effect was achieved.⁴ Different materials and concentrations were evaluated such as sodium perborate mixture with water; 10-30% carbamide peroxide; and 30-40% hydrogen peroxide. However, each material has its own advantages, limitations, and biological concerns.⁵ Furthermore, literature lacks consensus on the maximum number of applications or concentrations to be used.⁵ Opalescence Endo (ultradent™, Utah, USA) is a 35% hydrogen peroxide gel designed specifically for walking bleach method and has shown successful results.⁶ However, several authors have raised concerns regarding the biological effect of hydrogen peroxide on the surrounding tissue and its relation to cervical root resorption.⁷

Therefore the purpose of this case report was to document the effect of walking bleach method using 35% hydrogen peroxide on esthetics, surrounding tissue, and psychological impact on behaviour.

Case Presentation

A 39-year-old female patient reported to the dental & maxillofacial department at the Bahrain defense force hospital with a chief complaint of discolored maxillary left central incisor. Dental history included a root canal procedure that was done 2 years prior following orthodontic treatment. However, due to persistence of symptoms and repeated discharging sinus tract formation, root canal retreatment and periapical radicular surgery were done 1 year earlier (Figure: 1A). On examination, the tooth was asymptomatic and discolored (Figure: 1B). Radiographic findings indicated acceptable root canal filling with the radicular apical part showing evidence of root resection and apical seal (figure: 2A). The patient mentioned that the discoloured tooth negatively affected her smile and social life.

It was decided that internal non-vital tooth bleaching was to be done prior to considering other treatment alternatives.

Written consent was signed by the patient acknowledging approval and understanding of the procedure in terms of management and prognosis as well as adverse effects.

First visit

Two observers blindly recorded the tooth shade using a universal A-D shade guide (Ivoklar vivadent™, Schaan, Liechtenstein). They both agreed that the tooth was shade D3 (figure: 1B) while the adjacent vital teeth had a shade A2. After Rubber dam isolation and under dental operating microscope (D.O.M.) magnification X16 (M320 Leica™, Germany), the palatal composite occluding the access cavity was removed using cavity Access set (DENTSPLY™ Maillefer, Ballaigues, Switzerland). Similarly, about 3mm of the gutta-percha filling was removed from the radicular cervical part of the root and filled with glass ionomer cement (Ketacfil Plus Applicap, 3M ESPE™, GmbH, Germany)

A 35% hydrogen peroxide gel (Opalescence Endo, ultradent™, Utah, USA) was used to fill the pulp chamber in all directions and excess was removed. The cavity was then filled with glass ionomer (Ketacfil Plus Applicap™, 3M ESPE, GmbH, Germany) as a temporary seal.

Second visit

After five days following manufacturer recommendations, the patient was recalled for evaluation. At this point in time, the two observers agreed that the tooth shade was now A1 (figure: 1C). The procedure was considered successful as the patient was satisfied with the current shade and it was decided that further bleaching was not needed. After Rubber dam isolation and removal of the temporary cavity seal, the pulp chamber was thoroughly flushed to remove all remnants of the bleaching agent, and permanently filled with Filtek Z250 XT composite (3M ESPE™, GmbH, Germany).

Follow up

Follow up was done after 1 and 4 months to record shade change if any and to evaluate any changes clinically or radiographically. The tooth remained asymptomatic without any radiographic changes (figure: 2B) and the tooth shade previously recorded was stable without relapse at A1 shade (figure: 1D).



Figure (1A): post root canal treatment image - tooth colour shade A2; **Figure (1B):** post root canal treatment image (16 months) - tooth colour shade D3; **Figure (1C)** post-bleaching (5 days) - tooth colour shade A1; **Figure (1D)** follow-up image (4 months) - tooth colour shade A1.

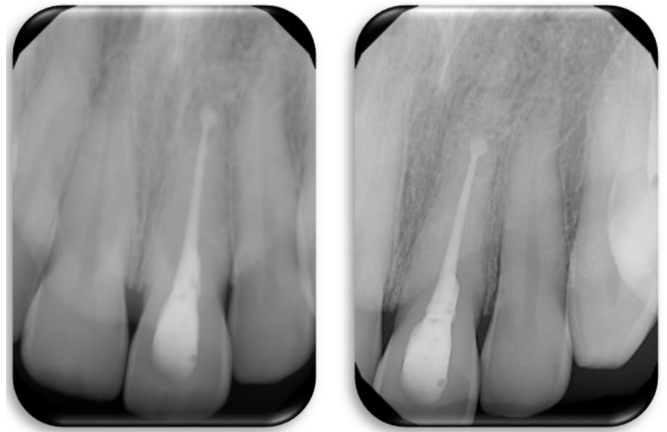


Figure 2A (Left): post root canal treatment periapical radiograph- **Figure 2B (right)** post-bleaching (4 months) radiograph

Discussion

This case report aimed to resolve a tooth discoloration that affected an upper central incisor post prior root canal treatment. The patient reported changes in her smile pattern where she became reluctant to smile and always tried to hide her teeth with her hands whenever she had to talk, eat, or laugh. The tooth had minimal restoration with most of the tooth structure sound and non-compromised. Therefore, an treatment such as labial veneers was considered invasive and an undesirable alternative. The bleaching agent type, concentration, application time, and repetition cycles if needed presented a challenge to avoid any possible biological adverse effects. It was the authors intention to use a bleaching agent that would perform the desired whitening action without the need for extended application time or multiple applications to reach a satisfactory result with minimal risk of adverse biological changes.

Non-vital teeth discoloration usually results from intrinsic factors such as pulp necrosis or pulp hemorrhage leading to breakdown of pulp tissue producing iron or hemoglobin particles which deposits into the dentinal tubules causing discoloration.⁸ The Walking bleaching method

was introduced in 1961, the author recommended placement of a mixture of sodium perborate and water into the pulp chamber which other investigators later replaced with 30-35% hydrogen peroxide to enhance the whitening effect.^{8,9} Regardless of the agent used, the main component of different bleaching agents is hydrogen peroxide which is an oxidizing agent capable of removing stains through its content of free hydroxyl radicals that reacts with the staining material molecules breaking it down.⁸

Many authors have compared the efficiency of hydrogen peroxide; sodium perborate and water mixture; carbamide peroxide in different concentrations and concluded that internal bleaching method is an effective; convenient; and relatively safe providing satisfactory results.⁵ Other authors have raised concerns over the biological influence of bleaching agents' leakage outside the tooth into the surrounding structures leading to cervical tooth resorption.^{5,10}

Several laboratory and animal studies have demonstrated that when placed intra-coronally hydrogen peroxide could diffuse through the root via the dentinal tubules especially when an external heat source is applied providing an acidic environment that is inductive of osteoclastic activity and bone resorption resulting in external cervical root resorption. In contrast, clinical *in vivo* studies showed no evidence of cervical root resorption and yet few authors recommend carbamide peroxide and sodium perborate-water mixture as the most suitable bleaching materials used for internal bleaching due to their low radicular diffusion.^{10,11,5} Other adverse effects included a decrease in dentin micro-hardness and crown fracture but many authors related these findings to extensive removal of intra-coronal dentin.^{7,11} Furthermore, there is limited evidence that hydrogen peroxide could induce any carcinogenic or genotoxic effect.⁷ To overcome the possibility of radicular diffusion of the bleaching agent; studies showed that removal of 3 mm of the canal filling material apical to amelo-cemental junction and placement of a cervical barrier of glass ionomer cement prevented or at least decreased diffusion of the bleaching agent through the dentinal tubules.^{5,11}

Literature lacks consensus on the material, concentration, and number of applications due

to biological concerns. It seems that efficiency is directly related to the bleaching agent type and concentration which when used in higher concentration requires less application time. However, this comes with an increased risk of adverse biological effects. Meanwhile, bleaching agents with lower concentration are relatively safer but require more application time which also presents a biological hazard.⁵

In this case report, the patient was dissatisfied with the discolored tooth and was considering treatment alternatives that included sacrificing the tooth structure to have a full coverage restoration that can restore the desired shade. The discolored tooth was always visible whenever she smiled, talked, or even with eating which affected her self-confidence; self-perception; and smile pattern. Many authors found that the effect of teeth discoloration on patients behaviour is related to several factors such as age; gender; and occupation, they also found that internal bleaching was effective in restoring the tooth colour to shades that were acceptable by patients leading to positive impact on their psychological behavior allowing them to restore their self-confidence and enhance their self-perception.^{12,13} Similarly, in our case report the discolored tooth shade changed from D3 to A1 in just one session which is considered clinically successful. The patient was also satisfied with the result and reported during the follow up sessions that she was able to resume her social interaction with others without feeling the need to alter her smile pattern in an attempt to hide the previously discolored tooth. It is also worth mentioning that the tooth shade remained A1, as recorded in the follow-up sessions after 1 & 4 months in contrast to several studies that recorded relapse in the achieved tooth shade.¹⁴ However, this possible relapse in tooth shade could not be prevented or controlled if it happens and regular recalls are always recommended.¹⁵

Conclusion

Within the limitation of this case report, it was concluded that 35% hydrogen peroxide gel could be used safely and effectively in altering the tooth shade in only one session when used with the walking bleach method with minimal risk of leakage into the surrounding structures having used

a proper radicular barrier. Treatment was successful and had a positive impact on patient satisfaction and self-perception. However, further studies are needed to determine a biologically evidence-based recommendation with regards to the bleaching agent material, concentration, application time, and number of repetitions that keeps the procedure within a biologically acceptable limit.

Ethical statement

This case report was approved by the research ethics committee – Bahrain Defence Force hospital. This case was approved by the patient and a signed informed consent was obtained

Declaration of Competing Interest

The authors have no conflict of interest to declare, this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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References

1. Kershaw S, Newton JT, Williams DM, et al. The influence of tooth colour on the perceptions of personal characteristics among female dental patients: comparisons of unmodified decayed and “whitened” teeth. *Br Dent J* 2008; 204:E9; 256-257.
2. Watts A, Addy M, et al. Tooth discolouration and staining: a review of the literature. *Br Dent J* 2001; 190:309-315.
3. Sheenam K, Lucky J, Kriti G, Kalpna T, Silky M, Himangi P, et al. Discoloration of Teeth: A Literature Review. *International Journal of Health and clinical Research* 2020; 3(2): 58-62
4. Spasser HF. A simple bleaching technique using sodium perborate. *NY State Dent J* 1961; 27:332-334.
5. Coelho AS, Garrido L, Mota M, Marto CM, Amaro I, Carrilho E, Paula A, et al. Non-Vital Tooth Bleaching Techniques: A Systematic Review. *Coatings*. 2020; 10(1):61.
6. Ozkocak I, Hekim M, Gokturk H, Adem K, Comert O, et al. The assessment of different bleaching agents’ efficiency on discoloured teeth using image-processing methods. *Photodiagnosis Photodyn Ther*. 2020; 31:101901.
7. Dahl JE & Pallesen U, et al. Tooth Bleaching-a Critical Review of the Biological Aspects. *Critical Reviews in Oral Biology & Medicine*. 2003; 14(4):292-304.
8. Plotino G, Buono L, Grande NM, Pameijer CH, Somma F, et al. Nonvital tooth bleaching: a review of the literature and clinical procedures. *J Endod*. 2008 Apr; 34(4):394-407.
9. Nutting EB, Poe GS, et al. A new combination for bleaching teeth. *J So CA Dent Assoc* 1963; 31:289-291.
10. Rokaya ME, Beshr K, Hashem Mahram A, Samir Pedir S, Baroudi K, et al. Evaluation of Extraradicular Diffusion of Hydrogen Peroxide during Intracoronal Bleaching Using Different Bleaching Agents. *Int J Dent*. 2015; 2015:493795.
11. Zimmerli B, Jeger F, Lussi A, et al. Bleaching of nonvital teeth. A clinically relevant literature review. *Schweiz. Mon. Zahnmed*. 2010; 120:306-320.
12. Gupta SK, Saxena P, et al. Evaluation of patient satisfaction after non-vital bleaching in traumatized discolored intact anterior teeth. *Dent Traumatol*. 2014; 30(5):396-399
13. Bersezio C, Martin J, Peña F, Rubio M, Estay J, Vernal R, Junior OO, Fernández E, et al. Effectiveness and Impact of the Walking Bleach Technique on Esthetic Self-perception and Psychosocial Factors: A Randomized Double-blind Clinical Trial. *Oper Dent*. 2017; 42(6):596-605.
14. Deliperi S. Clinical evaluation of nonvital tooth whitening and composite resin restorations: five-year results. *Eur J Esthet Dent* 2008; 3:148-159.
15. Dietschi D. Nonvital bleaching: general considerations and report of two failure cases. *Eur J Esthet Dent* 2006; 1:52-61.