*Type of article: Case Report*

# Light Activated Bleaching of Discoloured Non-Vital Tooth: A Case Report

**Sahithi Reddy[1], Alagarsamy Venkatesh[2], Newbegin Selvakumar Gold Pearlin Mary[3], Paramasivam Vivekanandhan[4]**

*[1] Second year PG Student, [2]Professor, [3]Reader, [4]Professor, Department and Institution, Department of Conservative Dentistry and Endodontics, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Narayanapuram, Pallikaranai,Chennai, Tamilnadu, India*

## Abstract

Trauma and pulpal infections are part of the routine of the dental practice. Common consequences in these cases are alterations in dental color, compromising patient's esthetics and his interaction in social environment. Bleaching aids to preserve dental structure as compared to full coverage crowns and also show immediate esthetic results. This clinical case shows a bleaching technique in devitalized teeth using bleaching agent with 35% hydrogen peroxide activated by LED light. The technique is simple to perform and also shows satisfactory results.

***Key words:*** *discoloration, bleaching, non-vital tooth*

## Introduction

The colour of natural teeth is affected by several parameters. It depends on the thickness, composition and structure of the tissues forming the tooth. These three parameters will evolve considerably through life, thereby influencing tooth colour. Any pathological or traumatic incidents can cause an everlasting impact on these dental structures. Tissue necrosis due to any cause can lead to release of disintegration by-products that may penetrate tubules and discolour the surrounding dentin. The degree of discolouration is directly related to how long the pulp has been necrotic. The longer the discolouration products are present in the pulp chamber, the greater the discolouration. To treat such discolourations various treatment modalities are available. Of them all, bleaching is known to be one of the most conservative procedures. Bleaching is defined as "the lightening of the colour of a tooth through the application of a chemical agent to oxidize the organic pigmentation in the tooth is referred to as bleaching" [(1)].

In 1864, Dr James Truman of the Pennsylvania College of Dental Surgery published "*Discolored and Necrosed Teeth"*, in which he described the technique for bleaching nonvital teeth. He is credited with the first successful method for bleaching teeth. His method included treating the patient every day for 1 to 4 weeks with chloride of lime combined with a weak acetic acid [(2)]. Techniques were refined throughout the decades using direct or indirect heat in attempts to accelerate the oxidation process [(3)]. Direct heat techniques eventually became less prevalent because of the risk associated with cervical resorption. Chemical techniques using sodium perborate and/or superoxol in the absence of heat continued with some success on nonvital teeth, but efficient techniques for multiple vital teeth were still lacking. Improvement in bleaching products in the mid-1990s including photosensitive formulas, and delivery systems such as light-cured barrier materials, increased use of in-office bleaching for multiple vital teeth [(4)]. Combined with the introduction of at-home

**Corresponding Author:**
**Dr. Sahithi Reddy,**
M.D.S., Second Year PG Student.
Department of Conservative Dentistry and Endodontics, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Narayanapuram , Pallikaranai,Chennai -600100.
Tamilnadu, India. Phone number: 8008684449
E-mail: sahithi.rdy@gmail.com

bleaching trays using carbamide peroxide, bleaching emerged as one of the most sought-after procedures in dentistry [5]. In 1994, Light activation of the bleaching agents was introduced which further led to the activation of bleaching agents by argon laser, CO2 laser and plasma arc. In 1999, Diode laser was first used for tooth whitening. A variety of concentrations of bleaching gels containing fluoride, other remineralising agents, and peroxide free chemicals are also available.

The most commonly used agents for bleaching endodontically treated teeth are 30%–35% hydrogen peroxide and sodium perborate either in combination or separately [6]. The techniques which have been used to bleach discoloured nonvital teeth are: walking bleach and modified walking bleach, non-vital power bleaching, and inside/outside bleaching. The walking bleach technique involves sealing a mixture of sodium perborate with water into the pulp chamber of the affected tooth, a procedure that is repeated at intervals until the desired bleaching result is achieved. Modification of this technique a combination of 30% hydrogen peroxide and sodium perborate is sealed into the pulp chamber for one week and is known as modified walking bleach. For internal non-vital power bleaching the hydrogen peroxide gel (>30%) is activated either by light or heat which raises the temperature between 50 and 60 C, it is maintained for five minutes before the tooth is allowed to cool for a further 5 min. Then, the gel is removed, the tooth is dried, and the 'walking bleach technique' is used between visits until the tooth is reviewed 2 weeks later to assess if further treatment is needed. Finally, the inside/outside bleaching technique is a combination of internal bleaching of non-vital teeth with the home bleaching technique [7]. These methods have a potential risk, which includes cervical resorption, under- or over-lightening, the possibility of colour regression, and external root resorption. Recently, a variety of products and techniques have been developed to resolve or minimize the side effects of the bleaching process. This development has been paralleled with rising interest among patients in correcting esthetic problems with their dentition [8,9]. Therefore, in the current case, many modifications have been done for bleaching techniques in an attempt to minimize the risk and side effects of the bleaching process.

Case report

A 42-year-old male patient with a complaint of discoloured upper front tooth came to our attention. On intraoral examination, the upper central incisor (#11) was a discoloured previously endodontic treated tooth with a broken composite restoration and the upper right lateral incisor (#12) has an Ellis class 1 type of fracture. Radiographic examination revealed a well-obturated tooth with an intact coronal seal and without any periapical pathologies. The patient was explained about different treatment options and he agreed on non-vital bleaching of 11 followed composite restoration of 11 and 12. Informed consent was taken before treatment. On the onset of treatment, the shade of the discoloured tooth was assessed under normal daylight with a Vita porcelain shade guide (Vita classic) and also, a pre-bleaching photograph was taken for the record (figure 1). On the first appointment 2mm of gutta-percha is removed from the canal orifice with a heated instrument and restored with GIC up to the canal orifice and the shape of the cervical barrier is made replicating the CEJ level and the interproximal bone level. And the pulp chamber is closed with temporary restoration (CaVit). 2 days later the bleaching process was started. The gingival is protected by water-soluble cream (Vaseline) applied to soft tissues, and rubber dam isolation was achieved, the flowable light-cured dam is placed in the gap between tooth and rubber dam. For this technique, a high concentration of hydrogen peroxide 35% (NAVKAR DENTAL MAXX WHITE OFFICE) is used. **It is available as a powder liquid system. It is mixed in 1:1 proportion. T**he mixture is inserted into the pulp chamber with an amalgam carrier. It is then activated with LED light for 5 minutes to increase the chemical reaction as advised by the manufacturer. This process is repeated twice more where we changed the gel and repeated the bleaching until desired results were obtained (figure 2). Then, the pulp chamber was rinsed and dried and filled with calcium hydroxide to be left in the pulp chamber for 2 weeks before the final or permanent filling material [10.11]. Clinical evaluation was recorded by comparing the tooth shade with its original one before treatment using the Vita porcelain shade guide and photographs (figure 3). After a week tooth was restored with composite resin, both in 11 and 12. Final polishing is done after 1 day and the patient was reviewed after 3 months and no colour variation was

observed (figure 4).

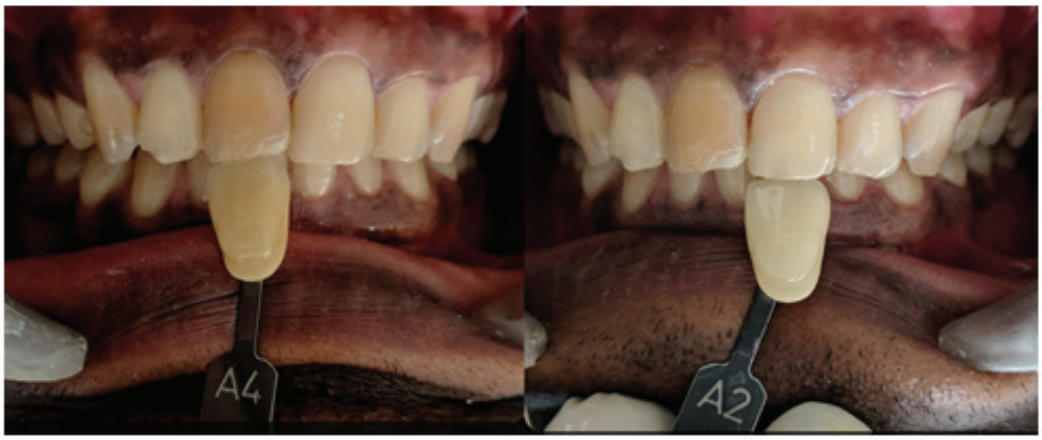


**Figure 1: pre-bleaching record of discolored and contra-lateral tooth.**


**Figure 2: Tooth shade variation: pre-operative, first appointment; second appointment; third appointment; post-restoration.**

**Figure 3: pre-bleaching, post-bleaching and post-restoration.**

**Figure 4: 6-month follow up**

## Discussion

The bleaching of teeth is a harmless process, but some conditions have to be respected like the correct and complete soft tissue isolation to protect them from eventual burns caused by the peroxide. Some modifications have been done in an attempt to minimize the risk of cervical or apical resorption by placing a base of 1–2 mm glass ionomer cement over the root filling material to assure a mechanical barrier between the sealed root canal and the bleaching gel, which is in agreement with other studies [8,12] but is in disagreement with Friedman et al. [13], as they did not use an intermediate lining before the bleaching material. Another modification added to the bleaching technique was on reaching the desired shade, the pulp chamber was obturated by calcium hydroxide for seven days before the final filling material was placed. This was necessary to allow for the elimination of residual oxygen, which interferes with the polymerization of the filling materials and to neutralize and render the medium alkaline that reduces the risk of cervical resorption [14]. The bleaching was done in three different appointments rather than one-time application as prolonged use causes bleaching action to slow down beyond a point during treatment. This is the point where whitening should be terminated. If it continues further decomposition of organic matrix and total loss of enamel matrix protein may occur [15]. *LED light was used to activate bleaching agent in this case. Light-emitting diode (LED) lamps* are solid-state, semiconducting energy sources that supply near-monochromatic light. LED lamps are currently one of the most energy-efficient and rapidly developing light technologies. Because LEDs produce a discrete or narrow spectrum of light, the light source requires no additional filtration of extraneous energy and produces very little heat. As a result, an LED bleaching light system is dependent less on heat and more on the wavelength-specific photochemistry of the bleaching formula and possible energy absorption of the natural tooth chromogens contributing to bleaching effect. The role of bleaching lights in dentistry is a topic for which there has been controversy and a lack of agreement. This lack of agreement can be attributed to variability associated with methods used to measure color, different light sources, and bleaching formula interactions [16]. Some clinical studies have reported significant effects with bleaching lights, whereas others have shown no effectiveness. Still, others have found mixed results depending on tooth inclusion [17] or method of color measurement [16]. The trend for future lamps may rely more on specialized light sources such as LEDs or lasers rather than filtered light to illuminate the teeth. As refinements in material photochemistry and improvements in spectral properties

of bleaching lamps continue, the use of supplemental light devices in dentistry is expected to remain popular and continue to grow in the foreseeable future [18].

## Conclusions

This case report demonstrates the successful management of a discolored non-vital tooth using 35% hydrogen peroxide gel with light activation as bleaching material, effectively and safely, by following modifications and precautions to eliminate the side effects of peroxides. More advanced studies still needed to gather more information about the stability of results and to detect any adverse effect that could appear.

**Source of Funding**: Nil

**Ethical Clearance**: Not required for a case report manuscript

**Conflict of Interest**: Nil

## References

1) Plotino G, Buono L, Grande NM, Pameijer CH, Somma F. Nonvital tooth bleaching: a review of the literature and clinical procedures. Journal of endodontics. 2008 Apr 1;34(4):394-407.
2) Truman J. Bleaching of non-vital discoloured anterior teeth. Dent Times. 1864;1:69-72.
3) Hanosh FN, Hanosh GS. Vital Bleaching: A New Light-Activated Hydrogen Peroxide System. Journal of Esthetic and Restorative Dentistry. 1992 May;4(3):90-5.
4) Barghi N. Making a clinical decision for vital tooth bleaching: at-home or in-office?. Compendium of continuing education in dentistry (Jamesburg, NJ: 1995). 1998 Aug;19(8):831-.
5) Haywood VB, Heymann HO, Scurria MS. Effects of water, speed, and experimental instrumentation on finishing and polishing porcelain intra-orally. Dental Materials. 1989 May 1;5(3):185-8.
6) Attin T, Paque F, Ajam F, Lennon AM. Review of the current status of tooth whitening with the walking bleach technique. International endodontic journal. 2003 May;36(5):313-29.
7) Alqahtani MQ. Tooth-bleaching procedures and their controversial effects: A literature review. The Saudi dental journal. 2014 Apr 1;26(2):33-46.
8) Amato M, Scaravilli MS, Farella M, Riccitiello F. Bleaching teeth treated endodontically: long-term evaluation of a case series. Journal of endodontics. 2006 Apr 1;32(4):376-8.
9) Walton RE, Rotstein I. Bleaching discolored teeth: internal and external. Principles and practice of endodontics. 1996;2:385.
10) Rotstein I, Walton RE. Bleaching discolored teeth: internal and external. Endodontics: Principles and Practice. 2008;391.
11) Steiner DR, West JD. A method to determine the location and shape of an intracoronal bleach barrier. Journal of endodontics. 1994 Jun 1;20(6):304-6.
12) Lorenzo JA, Gumbau GC, Sanchez CC, Navarro LF, Puy MC. Clinical study of a halogen light-activated bleaching agent in nonvital teeth. Quintessence international. 1996 Jun 1;27(6): 383-388.
13) Friedman S, Rotstein I, Libfeld H, Stabholz A, Heling I. Incidence of external root resorption and esthetic results in 58 bleached pulpless teeth. Dental Traumatology. 1988 Feb;4(1):23-6.
14) Titley KC, Torneck CD, Ruse ND, Krmec D. Adhesion of a resin composite to bleached and unbleached human enamel. Journal of endodontics. 1993 Mar 1;19(3):112-5.
15) MacIsaac AM, Hoen CM. Intracoronal bleaching: concerns and considerations. Journal (Canadian Dental Association). 1994 Jan 1;60(1):57-64.
16) Ontiveros JC. In-office vital bleaching with adjunct light. Dental Clinics. 2011 Apr 1;55(2):241-53.
17) Calatayud JO, Calatayud CO, Zaccagnini AO, Box MJ. Clinical efficacy of a bleaching system based on hydrogen peroxide with or without light activation. The European Journal of Esthetic Dentistry. 2010 Jun 1;5(2):216-24.
18) Zimmerli B, Jeger F, Lussi A. Bleaching of nonvital teeth. Schweiz Monatsschr Zahnmed. 2010 Jan;120(4):306-13.