Esthetic Rehabilitation of a Non-Vital Discolored Tooth Through Endodontic Retreatment and Intra-Coronal Bleaching: A Case Report

Faber Sidabutar[1,*], Hendra D A Dharsono[2]

[1]Resident of Conservative Dentistry, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia
[2]Department of Conservative Dentistry, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia

*Correspondence Author: sidabutarfaber@gmail.com

ABSTRACT

Background: Discoloration of non-vital anterior teeth is a common aesthetic concern, often associated with inadequate root canal treatment. A combined approach involving non-surgery endodontic retreatment and walking bleaching offers a conservative solution to restore both function and aesthetics.
Objective: To report the conservative management of a discolored non-vital anterior tooth using non-surgical endodontic retreatment and the walking bleach technique.
Case Report: A 24-year-old female presented with a complaint of anterior tooth discoloration persisting for the past two years, affecting her appearance. Patient experienced spontaneous pain five years earlier while undergoing orthodontic treatment. Six months earlier, the patient had undergone an incomplete root canal treatment, with radiographic examination revealing a non-hermetic obturation. Clinical examination revealed tenderness to percussion on tooth #11 and radiographic evaluation confirmed inadequate canal filling. According to the American Association of Endodontists (AAE) diagnostic criteria, tooth #21 was diagnosed as previously treated with symptomatic apical periodontitis. Non-surgical endodontic retreatment was performed with interim calcium hydroxide medication. The canal was obturated using the warm vertical compaction technique in combination with a bioceramic sealer to ensure tight seal. Bleaching was carried out using the walking bleach technique with 35% hydrogen peroxide. After the colour improved the tooth was restored with composite resin. Follow-up showed favourable aesthetic outcomes and patient satisfied with the result.
Conclusion: Non surgery endodontic retreatment combined with intra-coronal bleaching using 35% hydrogen peroxide is an effective and conservative approach for managing discoloration of non-vital anterior teeth with a history of inadequate treatment.

Keywords
Discoloration, Retreatment, Intra Coronal Bleaching

INTRODUCTION

Discoloration of anterior teeth presents a significant esthetic concern for patients, especially in the smile zone. The etiology of discoloration in non-vital teeth includes pulpal necrosis, residual endodontic materials, and penetration of chromogenic substances into dentinal tubules over time.[1] Conventional restorative options, including full coverage crowns and veneers, can effectively mask intrinsic discoloration; however, they frequently necessitate substantial removal of sound dental tissue, thereby compromising the tooth's biomechanical integrity. Conversely, more conservative approaches, such as internal bleaching in combination with adhesive restorative techniques, provide a minimally invasive alternative that preserves tooth structure while achieving satisfactory esthetic results.

Internal bleaching of devitalized teeth with hydrogen peroxide–based agents has been consistently reported as an effective method to reverse intrinsic discoloration, particularly when combined with the placement of appropriate intraorifice barriers to minimize the risk of cervical resorption. The walking bleach technique, originally described decades ago, continues to be a clinically reliable approach owing to its relative simplicity and predictable outcomes.[2,3] Moreover, recent evidence underscores the necessity of nonsurgical retreatment in cases with inadequate prior root canal therapy, since persistent microbial leakage and remnants of endodontic materials may contribute not only to discoloration but also to the development or persistence of periapical pathology.[4]

It is generally recommended to postpone adhesive restorative procedures for approximately 1 to 3 weeks after bleaching, as residual oxygen within the dental hard tissues may adversely affect the polymerization process and compromise the interfacial bond strength to enamel and dentin, thereby reducing both the longevity and color stability of the restoration. Furthermore, when performing direct composite veneers to mask discolored tooth structures, clinicians should account for the inherent optical properties of natural teeth—such as opalescence, translucency, anatomical contour, and surface textur to achieve an esthetically harmonious outcome.[5]

OBJECTIVES

To present the aesthetic management of a non-vital discoloured maxillary central incisor through endodontic retreatment followed by intra-coronal bleaching.

CASE REPORT

A 24-year-old female patient presented to the Department of Conservative Dentistry RSGM Universitas Padjadjaran, Bandung, Indonesia, with discoloration of her upper front tooth for the past two years. The patient complained that the discoloration was disturbing her appearance. Patient experienced spontaneous pain five years earlier while undergoing orthodontic treatment. Six months earlier, the patient had undergone an incomplete root canal treatment with radiographic examination revealing a non-hermetic obturation without final restoration. There was no history of swelling in the affected tooth. The patient denied any history of systemic disease or allergies.

Extra oral examination showed a symmetrical face, no abnormalities on lips and temporomandibular joints, sub-mandibular lymph nodes were not palpable and painless. Intraoral clinical examination of tooth #21 revealed discoloration. Pulp vitality / Cold test (-), percussion (+), palpation (-), tooth mobility (-), and fistula (-). Radiographic examination: A radiopaque image in the root canal resembling root canal filling material was found (Figure 2). Based on the clinical examination and radiographic results, tooth #21 was diagnosed as previously treated with symptomatic apical periodontitis according to American Association of Endodontist (AAE). The patient was explained the results of the examinations, diagnosis, treatment plan, and possible complications before the procedure. The treatment plan included a non-surgical root canal retreatment followed by intracoronal bleaching. The patient understood the explanation regarding her condition and agreed to the treatment by signing an informed consent form. This case has a good prognosis, as the patient has no history of systemic disease, cooperative, and responds well to the education and information provided by operator.

Figure 1. Pre-operative

In the first visit after a clinical and radiographic examination, shade guide (Vita shade) was used to determine the initial colour scale and the desired colour to resemble the other teeth. The colour of the tooth was C4 (Figure 1). Tooth was isolated using a rubber dam (Sanctuary) and the access cavity was redefined. Root canal filling material was removed with Reciproc Blue R25 (VDW, Germany) (Figure 3). Root canal was prepared with Reciproc Blue R40 (VDW, Germany); irrigation was done with NaOCL 5% (Onemed, Indonesia) and EDTA 17% (Onemed, Indonesia). Intra canal medicament was applied using Calcipex II (Nippon, Japan) for 2 weeks and temporary filling was placed.

Figure 2. Pre-operative Dental X-Ray

Figure 3. After Root canal filling removed

The second visit was conducted two weeks after the initial medicament application. Clinical and radiographic examinations were performed again and no complaints were found in tooth #21. After the examination rubber dam was placed then the temporary filling was removed, and the Ca(OH)2 medicament was removed from the root canal. Irrigation was performed sequentially using 5% NaOCl and 17% EDTA. The root canal was dried using sterile paper points. Root canal filling with gutta-percha cone R40 (VDW GmbH, Germany) and bioceramic sealer Ceraseal (Meta-Biomed, Korea).

Figure 4. Obturation and RM GIC as a barrier

The gutta-percha was reduced to 2 mm below the cento-enamel junction (CEJ), and resin modified glass ionomer; Ionoseal (Voco, Germany) was placed as a barrier 1-2 mm over the gutta-percha that cover the root canal corresponding to the cementoenamel junction height (Figure 4). Opalescene Endo bleaching agent with 35% hydrogen peroxide (Ultradent, US) was placed in pulp cavity and temporary filling was placed using Ionoseal (Voco, Germany).

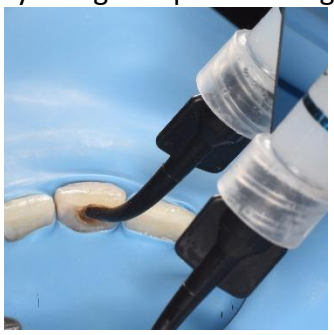
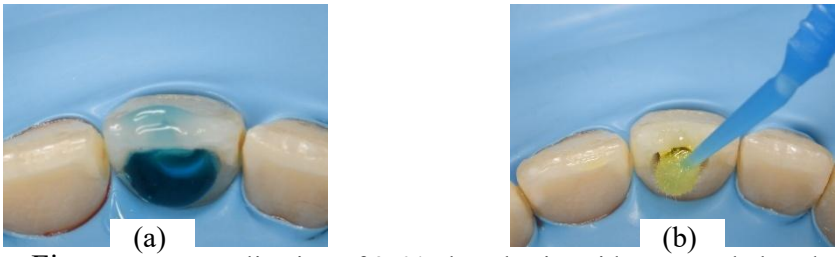


Figure 5. Placement of Intra Coronal Bleaching

The third visit was carried out one week after bleaching. Clinical and radiographic examinations were performed again and no complaints were found in tooth Clinical examination presented tooth #21 with changed colour to A1 (Vita Shade) (Figure 6). Temporary filling was removed then pulp cavity rinsed with distilled water. Calcium hydroxide was placed in to the pulp cavity and temporary filling was placed.

Figure 6. After application of intra coronal bleaching



(a) (b)

Figure 7. (a) Application of 37% phosphoric acid; (b) Single bond (3M ESPE) application

The fourth visit was carried 2 weeks later. The procedure involved removing the temporary filling and cleaning the pulp cavity. A direct composite veneer combined with restoration of the palatal access cavity was carried out to ensure optimal esthetic integration and functional coherence with the remaining dentition. Application of 35% phosphoric acid etch for 20 seconds following application of Single Bond Universal (3M, US) and light cure with for 20 seconds (Figure 7). An UD2 Ena HRI shade (Micerium, Italia) was applied in the pulp cavity and NE enamel shade (Tokuyama, Japan) was applied to cover labial surface and to close the gap between #11 and #21. Shaping and finishing the restoration with soflex polishing disc (3M, US) (Figure 8). A follow-up visit was conducted 3 months after the restoration. Clinical and radiographic examinations revealed stable tooth color (A1), no periapical lesions, and no cervical resorption.

Figure 8. Final Restoration

DISCUSSION

Survival of the tooth after root canal treatment (RCT) is defined as the persistent presence and function of the tooth with no clinical symptoms.[6] Root canal treatment success in the long term is dependent on a number of parameters: patient demographic and systemic profile, technical skill of the operator, structural and periodontal status of the tooth, endodontic technical success, and quality of the coronal restoration. Failure of initial root canal treatment, in this instance the compromised integrity of coronal seal leading to reinfection of the root canal and resultant symptoms and failure of the primary therapy.[7] Presence of apical periodontitis on a treated tooth was the indication for the indication for nonsurgical endodontic retreatment. Non-surgical retreatment was selected first because of a faulty obturation hindering periapical healing and resulting in symptoms and failure of the initial treatment.[4,7] Nonsurgical retreatment provides the potential for restoring proper disinfection and a hermetic seal with contemporary instrumentation and materials, including bioceramic sealers, and thus enhancing the long-term prognosis.[8,9]

Tooth discoloration in this case can be attributed to pulpal necrosis during orthodontic treatment, where excessive or continuous forces may impair pulpal blood flow, resulting in pulp death and subsequent internal discoloration.[10,11] Following hemolysis, erythrocytes liberate heme that combines with degenerating pulpal tissue to produce black iron sulfide.[1,12] In this case, the patient discoloration occurred while undergoing orthodontic treatment, and this supports the postulation that excessive or prolonged orthodontic forces could have impaired the vascular supply of the pulp to cause ischemia and ultimately necrosis. Necrosis that occurs during orthodontic treatment thus offers a biologically possible explanation for discoloration in this patient.

During retreatment procedures, files and irrigating solutions allow for simple removal of filling materials already present, thus direct treatment against microbial agents and debris causing apical periodontitis.[13] This is utilizing Reciproc Blue R25 file (VDW, Germany) to remove already present filling material. Even though it is not designed for endodontic retreatment, R25 is used to remove filling material residues as efficiently as a rotary instrument.[14,15] Warm vertical condensation with a bioceramic sealer was used for obturation. The technique enables thermoplasticized gutta-percha to penetrate into the canal irregularities while bioactivity, dimensional stability, and chemical bonding to dentin are offered by the bioceramic sealer. Obturation in the third dimension is critical to avoid the reinfection of the root canal system through entombing the remaining microorganisms and the avoidance of periapical leakage. Root canal sealers are used to aid in the ideal adaptation of gutta-percha to canal surfaces via filling surface irregularities and gap spaces. Bioceramic-based sealers incorporate bioactive molecules that promote periapical healing and stimulate dentin mineralization. Their optimal characteristics of optimal flow, optimal alkaline pH, and minimum cytotoxicity are the reasons for effective sealing of canals, microbial removal, deposition of hydroxyapatite, and subsequent periapical tissue regeneration.[16]

Effective bleaching is contingent on proper disinfection and sealing of the canals before treatment, since the bacteria or pulpal debris could compromise treatment success and support tooth structure.[17] Furthermore, the application of a glass ionomer cement (GIC) or resin-modified GIC barrier over the obturation line is also regarded as necessary in a bid to

inhibit hydrogen peroxide diffusion to periodontal tissues, which is a significant consideration in an effort to prevent cervical resorption risk.[18] Glass ionomer is used as an intra-orifice barrier to prevent released radicals from entering and seal root canals. Since the bleaching agent may trigger the inflammatory process that will result in cervical invasive resorption once it penetrates the periodontium, the GIC barrier must be scalloped to the form of a "bobsled tunnel" and 2 mm in thickness to mimic the form of the cementoenamel junction.[1,17]

The walking bleach is safe and effective when performed under controlled conditions with appropriate protective barriers. There was no significant difference between carbamide peroxide (35%, 37%), hydrogen peroxide (35%), and sodium perborate with hydrogen peroxide (3%, 30%), however all of these substances were much more effective than sodium perborate.[1] This case using 35% hydrogen peroxide (Opalescence Endo) for bleaching, selected as it provides a conservative, non-invasive solution to restore aesthetics without additional tooth preparation. Hydrogen peroxide acts through the formation of reactive oxygen species that penetrate dentinal tubules, oxidizing chromogenic molecules and thus lightening the tooth colour.

Restorative treatment outcomes are frequently selected due to their superior cosmetic results. Dark discoloration on the tooth surface can also be covered up with direct and indirect restorations. When there is significant discoloration or substantial tooth deterioration, restorative therapy becomes necessary. To cover up the discoloration, various materials, cements, and dental preparations are employed. Intracoronal bleaching represents a commonly employed, minimally invasive technique for the management of discoloration in endodontically treated non-vital teeth. This approach has been shown to be effective in improving dental esthetics and is associated with a high level of patient satisfaction.[5] In this case, after successful bleaching, direct composite veneer was chosen as the final restorative procedure. Direct adhesive restorations have many benefits such as conservation of remaining healthy tooth structure, more control of optical features such as translucency and opalescence, and the possibility of gaining immediate aesthetic integration with neighbouring dentition. A conservative technique such as that was especially warranted in this patient, as it restored function and aesthetics without the unnecessary removal of healthy tooth structure.

The favorable clinical and esthetic results obtained in this case are in agreement with previous reports supporting the combination of nonsurgical endodontic retreatment and internal bleaching as a predictable and conservative strategy for managing discoloration in non-vital anterior teeth. Continuous long-term monitoring is essential to evaluate color stability and to detect potential adverse outcomes, such as external cervical resorption or recurrence of endodontic infection

CONCLUSION

Internal bleaching represents a conservative and predictable approach for managing intrinsic discoloration of non-vital teeth, commonly associated with pulpal necrosis. Hydrogen peroxide remains the most frequently employed bleaching agent, typically applied in conjunction with an intraorifice barrier such as glass ionomer cement to minimize the risk of cervical resorption. In certain protocols, calcium hydroxide may be placed prior to definitive

restoration to improve treatment outcomes and ensure pulpal space alkalinization. When combined with direct composite veneers, this technique provides a minimally invasive strategy that preserves tooth structure while delivering durable and esthetically pleasing results.

REFERENCES

1. Plotino G, Buono L, Grande NM, Pameijer CH, Somma F. Nonvital Tooth Bleaching: A Review of the Literature and Clinical Procedures. *J Endod*. 2008;34(4):394-407. doi:10.1016/j.joen.2007.12.020
2. Portillo FRL, Urias AEV, Arredondo TG, et al. Internal tooth bleaching: a review. *Int Surg J*. Published online May 3, 2025. doi:10.18203/2349-2902.isj20251415
3. Coelho AS, Garrido L, Mota M, et al. Non-Vital Tooth Bleaching Techniques: A Systematic Review. *Coatings*. 2020;10(1):61. doi:10.3390/coatings10010061
4. Torabinejad M, Corr R, Handysides R, Shabahang S. Outcomes of Nonsurgical Retreatment and Endodontic Surgery: A Systematic Review. *J Endod*. 2009;35(7):930-937. doi:10.1016/j.joen.2009.04.023
5. Dias PC, Franco FBMJ, Palma-Dibb RG, Silva RCPE, Faraoni JJ. Different approaches for aesthetic rehabilitation of discolored nonvital anterior teeth. *RGO - Rev Gaúcha Odontol*. 2021;69:e20210039. doi:10.1590/1981-86372020000 3920190174
6. Friedman S. Prognosis of initial endodontic therapy. *Endod Top*. 2002;2(1):59-88. doi:10.1034/j.1601-1546.2002.20105.x
7. López-Valverde I, Vignoletti F, Vignoletti G, Martin C, Sanz M. Long-term tooth survival and success following primary root canal treatment: a 5- to 37-year retrospective observation. *Clin Oral Investig*. 2023;27(6):3233-3244. doi:10.1007/s00784-023-04938-y
8. Ng Y -L., Mann V, Gulabivala K. Tooth survival following non-surgical root canal treatment: a systematic review of the literature. *Int Endod J*. 2010;43(3):171-189. doi:10.1111/j.1365-2591.2009.01671.x
9. Dong L, Li J, Xue P, et al. Clinical outcomes of nonsurgical root canal treatment using C-root SP combined with different obturation techniques in older patients: a randomized controlled clinical trial. *BMC Oral Health*. 2025;25(1):728. doi:10.1186/s12903-025-06117-9
10. Hamilton RS, Gutmann JL. Endodontic-orthodontic relationships: a review of integrated treatment planning challenges. *Int Endod J*. 1999;32(5):343-360. doi:10.1046/j.1365-2591.1999.00252.x
11. Parashos P. Endodontic–orthodontic interactions: a review and treatment recommendations. *Aust Dent J*. 2023;68(S1). doi:10.1111/adj.12996
12. Manuel ST, Abhishek P, Kundabala M. Etiology of tooth discoloration- a review. *Niger Dent J*. 2010;18(2):56-63. doi:10.61172/ndj.v18i2.143
13. Marques Da Silva B, Baratto-Filho F, Leonardi DP, Henrique Borges A, Volpato L, Branco Barletta F. Effectiveness of ProTaper, D-RaCe, and Mtwo retreatment files with and without supplementary instruments in the removal of root canal filling material. *Int Endod J*. 2012;45(10):927-932. doi:10.1111/j.1365-2591.2012.02051.x
14. Vieira SM, Coaguila-Llerena H, Camilli AC, Reis Pavanelli AL, Portela Oliveira L. Effectiveness of ProTaper Retreatment, WaveOne Gold and Reciproc Blue Systems in Removing Obturation Material. *Int J Odontostomatol*. 2024;18(4):510-513. doi:10.4067/S0718-381X2024000400510

15. De-Deus G, Belladonna FG, Zuolo AS, et al. Effectiveness of Reciproc Blue in removing canal filling material and regaining apical patency. *Int Endod J*. 2019;52(2):250-257. doi:10.1111/iej.12991
16. Seron MA, Nunes GP, Ferrisse TM, et al. Influence of bioceramic sealers on dentinal tubule penetration and antimicrobial effectiveness: a systematic review and meta-analysis of in vitro studies. *Odontology*. 2024;112(3):672-699. doi:10.1007/s10266-024-00904-6
17. Mohammadi Z, Shalavi S, Yazdizadeh M. Antimicrobial Activity of Calcium Hydroxide in Endodontics: A Review. *Chonnam Med J*. 2012;48(3):133. doi:10.4068/cmj.2012.48.3.133
18. Feiz A, Faghihian H, Mahdaviani MS. Effect of Different Protective Bases on pH Changes and Hydrogen Peroxide Microleakage During Intracoronal Bleaching. *Front Dent*. Published online May 14, 2023. doi:10.18502/fid.v20i14.12684