# Aesthetic Rehabilitation of Maxillary Anterior Teeth Following Internal Bleaching with Direct Composite Veneers

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**ABSTRACT**

**Background:** Intrinsic discoloration often present significant aesthetic challenges, particularly in patients with a history of an inadequate endodontic treatment. In such cases, a combining internal bleaching, endodontic therapy, and aesthetic rehabilitation is required to restore both function and appearance. This minimally invasive approach supports long-term aesthetic outcomes while preserving tooth structure.
**Objective:** To present the management of intrinsic discoloration and anterior tooth asymmetry using internal bleaching, endodontic retreatment and direct composite veneers.
**Case Report:** A 24-year-old female came to the Department of Conservative Dentistry, Padjadjaran University presented with discoloration of tooth 21, which had undergone an inadequate endodontic treatment several years using a zinc oxide-based root filling material. Internal bleaching was performed using the walking bleach technique with 35% hydrogen peroxide. Meanwhile, on tooth 11 presented with a periapical abcess and root canal treatment was presented. After achieving a shade match, old composite restoration on teeth 11,21 were removed and replaced with new direct composite veneers. Additionally, both maxillary lateral incisors received direct composite veneers to correct tooth shape and achieve aesthetic balance.
**Results:** The combination of internal bleaching and endodontic retreatment successfully eliminated the discoloration and resolved the infection. Composite veneers provided an aesthetically pleasing and balanced outcome.
**Conclusion:** Internal bleaching, when combined with endodontic therapy and direct composite veneers, offers a conservative and effective solution for managing complex anterior aesthetic cases. Addressing both discoloration and morphological imbalance can significantly improve the final aesthetic outcome.

**Keywords**
aesthetic rehabilitation, anterior tooth discoloration, internal bleaching, walking bleach, zinc oxide sealer

## INTRODUCTION

Tooth whitening has become one of the most popular cosmetic treatments in recent years, driven by the common aesthetic complaint of tooth discoloration among patients. Aspects such as disharmony and changes in dental position, colour, shape, and size can compromise facial harmony, especially since the anterior teeth play a fundamental role in smile aesthetics, with their appearance greatly influencing smile attractiveness.[3,4] Addressing tooth discoloration requires a variety of approaches for both clinicians and patients, all aimed at achieving an optimal and visually pleasing outcome.[5]

To effectively manage tooth discoloration and achieve aesthetic results, clinicians must consider its type (intrinsic, extrinsic, or both), origin, severity, and whether the tooth is vital or endodontically treated, as each condition requires a specific internal or external treatment approach.[5,6,7] Internal tooth bleaching is a minimally invasive, relatively conservative, effective, and low-cost method commonly used to treat intrinsic discoloration in non-vital, endodontically treated teeth without excessive tooth structure removal[8,9,10] Walking Bleach is the preferred intra coronal bleaching technique for darkened teeth due to its higher safety and success rate compared to other methods like the thermocatalytic technique or their combination. [4,11] Adhesive restorations should be delayed for 1 to 3 weeks following a bleaching procedure because the remaining oxygen can interfere with the bonding between the restorative material and the enamel or dentin, potentially reducing both the durability and colour stability of the restoration. When performing direct composite veneers to cover discoloured tooth structures, it is important to consider the optical characteristics of natural teeth, including opalescence, translucency, shape, and surface texture.[12]

This case report describes the management of intrinsic discoloration with previously treated performed with endodontic retreatment and direct composite veneer with digital smile design.

## CASE REPORT

A 24-year-old female came to the Department of Conservative Dentistry at Dental Hospital Padjadjaran with a chief complaint of discoloration in her central incisors and dissatisfaction with visible old composite restoration at her upper central incisors. After anamnesis, the clinical evaluation showed a yellow coloration at her upper left central incisor (tooth 21). The tooth was endodontically treated in 2016 and discoloured two years ago. The radiographic examination tooth 21 had undergone an inadequate endodontic treatment. Pulp vitality/Cold test (-), percussion (+), palpation (-), tooth mobility (-). The tooth 11 presented with a periapical abscess, pulp vitality /Cold test (-), percussion (+), palpation (+), mobility (-). Both maxillary lateral incisors appeared smaller in size compared to the adjacent teeth. According to American Association of Endodontist (AAE), diagnosis for tooth #11 is pulp necrosis with chronic apical abcess ,tooth 21 is previously treated with symptomatic apical periodontitis and for tooth 12, 22 is normal pulp.

The patient was informed about the condition of her teeth, treatment options, maintenance procedures, cost and multiple visits of treatment and complications that might be occurred. The treatment was begun by scaling and polishing for preparing a healthy supporting tissue. Management of this case carried out root canal treatment 11, non surgical retreatment 21, internal bleaching 21 and aesthetic rehabilitation with direct composite veneer restorations on tooth 12,11,21,22 through the use of digital smile design. A series of preoperative extraoral and intraoral operative procedure (Figure 1). The intraoral scanner is used as a digital model to accurately capture the patient's oral anatomy for diagnosis and treatment planning.

**Figure 1.** Serial preoperative dental photography

The initial phase involved analyzing and calculating the Digital Smile Design, resulting in a final visual outcome presented to the patient.


**Figure 2.** Visualization of the final restoration design with Digital Smile Design


**Figure 3.** Transfer Digital Smile Design

Diagnostic wax-up was made on the study model with digital design as a guide. Putty index for a palatal matrix was created by impressing Diagnostic wax-up with elastomer heavy and light body.

**Figure 4.** Diagnostic wax-up

Root canal treatment was performed on tooth 11, while a retreatment procedure was carried out on tooth 21. Radiographic examination revealed inadequate root canal filling on tooth 21 and a periapical abscess associated with tooth 11. The Protaper Gold system (Dentsply) was used for both treatments, with the master apical file (MAF) size F2 for tooth 11 and F3 for tooth 21. Irrigation was performed on tooth 21 to remove the root canal filling material. Irrigation was done with 5,25% NaOCl solution, EDTA 17%, and Chlorhexidine. Irrigation was activated using passive ultrasonic irrigation (PUI). The root canals were dried using sterile paper points, followed by the placement of an intracanal medicament, Calcipex (Nishika, Japan), for 14 days. The cavity was temporarily sealed with Cavit (3M ESPE, USA). After 14 days, the calcium hydroxide medicament was replaced. A radiographic evaluation was then performed to assess the reduction in lesion size. Once a decrease in lesion size was observed and the percussion test negative results, obturation of teeth 11 and 21 was carried out using gutta-percha and a bioceramic sealer with significant sealing properties.

The dental crown length was measured with a periodontal probe and 2.0 mm of gutta percha was removed to allow the insertion of cervical barrier with glass ionomer cement. After the material had fully set, hydrogen peroxide 35% was applied to the labial surface of the involved tooth as the bleaching agent. The pulp chamber was subsequently covered with a sterile cotton pellet and temporarily sealed with glass ionomer cement.


(a) (b) (c)

**Figure 5.** (a) Pre-operative Dental X-Ray; (b) Trial obturation; (c) obturation & Glass ionomer cement as cervical seal

(a) (b) (c)

**Figure 6.** (a) Cervico-incisal length measurement; (b) Gutta percha reduction; (c) Placement cervical barrier

The patient was instructed to return for follow-up evaluation after one week. On the next visit, a subjective examination was conducted and there was no complaint from the patient. Objective examination showed tooth discoloration from A4 to A2- Vitapan Classical. The patient was recalled after 5 days. On the next visit, shade has changed from A2 to A1.


(a) (b) (c)

**Figure 7.** (a) Before application (A4) (b) First application (A2) (c) Second application (A1)

After achieving the desired shade match, a mock-up was performed on teeth 12, 11, 21, and 22 using Charm temp (Dent Kist Korea) shade A2.

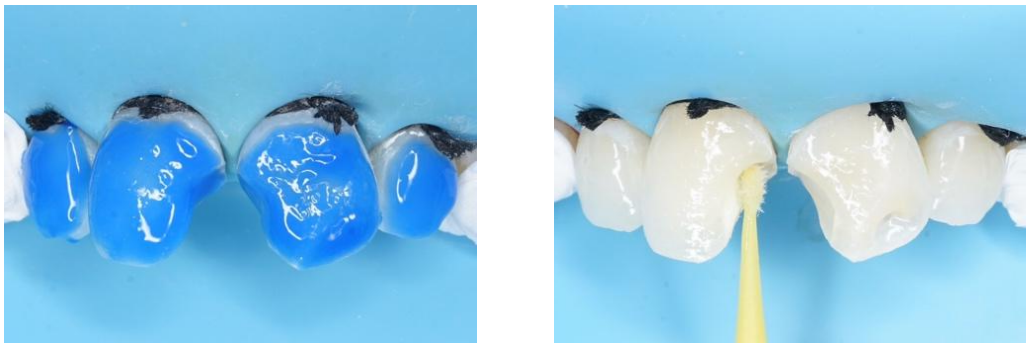
**Figure 8.** A mock-up trial on patient's mouth

Mock-up was removed on the next visit. Vita classical shade was used for colour selection guidance (A1). The teeth were isolated by rubber dam and prepared on the labial surface abrasively.The old composite restorations on teeth 11 and 21 were removed, followed by labial surface preparation of the maxillary lateral incisors.

(a) (b)

**Figure 9**. (a) isolation with rubber dam and button technique; (b) Tooth preparation

Phosphoric acid 37% acid was carried out, rinsed and dried on each tooth. Single Bond (3M ESPE) was applied by using the micro applicator on the tooth surface for 20 seconds, then sprayed with 3-way syringe for 5 soconds and cured for 10 seconds.



(a) (b)

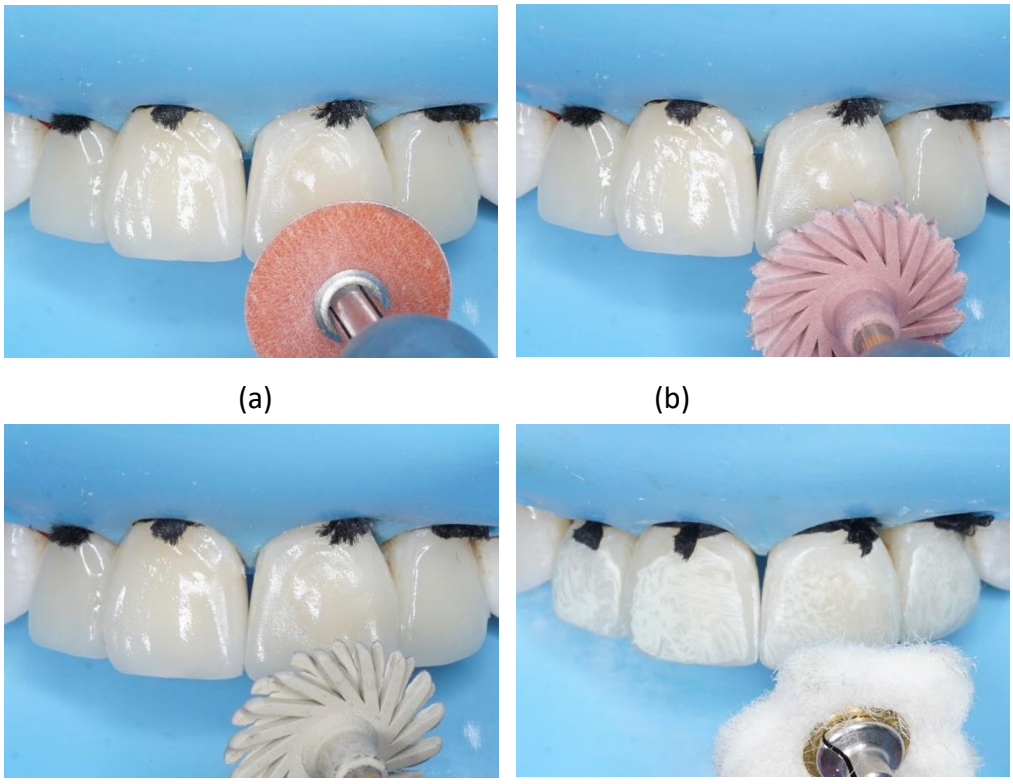
**Figure 10.** (a) Application of 37% phosphoric acid; (b) Single bond (3M ESPE) application

A palatal matrix was used to make a palatal shell with translucent shade colour guidance. Mesial and distal proximal walls were made using translucent composite colour guidance, followed by applicating dentin colour UD3 and UD2. The translucent colour composite was used to mimic the halo effect. Labial surface reconstruction was carried out using A1 composite colours.

(a) (b)

**Figure 11.** (a) Palatal matrix; (b) Palatal and proximal wall

Finishing was begun with using superfine bur and Soflex disk (3M, US) to reduce the excess restoration on the cervical and proximal areas. Transitional line, developmental groove, and perykimata were made to get characteristics on the labial surface.



(a) (b)

(c ) (d)

**Figure 12.** Finishing and polishing procedures; (a) shaping and finishing with Soflex disc; (b) polishing with Eve diacomp pink; (c) polishing with Eve diacomp grey; (d) Polishing with Lucida

The patient had a high level of aesthetic expectation as she had a history of failed attempts to restore the discoloured tooth. Although she experience a slight regression of the tooth colour during treatment, after the restoration with a direct veneer, the result was very satisfactory and reached her expectation.

**Figure 13.** Final direct restoration of tooth 12,11,21,22

(a) (b)

**Figure 14.** Clinical Photograph after treatement: (a) before; (b) after

## DISCUSSION

Tooth discoloration, particularly in the anterior region, can significantly compromise a patient's dental aesthetics and self-confidence. Management options span a broad spectrum, ranging from invasive procedures such as crowns, veneers, and direct restorations to more conservative approaches including micro abrasion, macro abrasion, bleaching, and even routine prophylaxis.

In contrast to crowns and veneers, which require substantial removal of tooth structure, tooth bleaching is considered a minimally invasive and conservative treatment modality.[14,15]

Internal bleaching sometimes called intra coronal bleaching is a conservative approach to improve the appearance of non-vital, endodontically treated anterior teeth that exhibit intrinsic discoloration due to factors such as pulp hemorrhage, necrosis, residual pulp tissue, or endodontic materials penetrating dentinal tubule.[16] One of endodontic material is zinc-oxide–based sealers are notorious for inducing coronal discoloration over time if remnants remain in the pulp chamber. Metallic components and chromogenic by-products in these sealers darken dentin, resisting bleaching and often necessitating complete removal before the bleaching procedure.[17] It can be concluded that sealers containing ZOE are likely to cause noticeable discoloration and, as a result, their use should be carefully considered in areas where aesthetics are important. [17]

In this case, the discoloration of tooth 21 was caused by intrinsic factors due to remnants of endodontic obturation material retained within the pulp chamber. The presence of these materials led to internal staining of the tooth structure.[18,19] Clinically, tooth 11 presented with a periapical abscess, which may have been associated with a history of trauma. Traumatic injury can lead to degeneration of the pulpal vasculature, resulting in vascular necrosis and the establishment of an anaerobic environment conducive to the proliferation of opportunistic microorganisms. Necrotic materials may exit the root canal system and infiltrate the surrounding periradicular tissues, ultimately leading to the development of endodontic lesions.[5]

A variety of materials are now utilized for dental bleaching, primarily involving the use of peroxide-based compounds in varying concentrations, formulations, and delivery methods. The most commonly used bleaching agents today include hydrogen peroxide, carbamide peroxide, and sodium perborate.[20] In this case, a peroxide-based bleaching material was used. Hydrogen peroxide is a strong oxidizing agent. The mechanism of teeth whitening is the oxidation reaction of peroxide.[21] Bleaching agents that release hydrogen peroxide are chemically unstable and should be kept in a dark, cool environment or refrigerated. Due to its low molecular weight, hydrogen peroxide can penetrate dentin, releasing oxygen that breaks down the double bonds of both organic and inorganic substances within dentinal tubules and stained dentin. Intracoronal bleaching with the use either of the thermocatalytic method, the walking bleach method or both in combination. The walking bleach is an intracoronal bleaching method for the bleaching discoloured teeth and has general acceptance.[5] A 1–2 mm layer of glass ionomer cement can be applied over the root canal filling to serve as a mechanical barrier separating the sealed canal from the bleaching gel to reduce risk of cervical resorption. Additionally, the pulp chamber may be filled with calcium hydroxide for seven days prior to the final restoration.[7,22] A substantial release of oxygen occurs during the bleaching reaction, particularly within the first 24 hours, and may persist for up to 10 days. This oxygen release can lead to increased intracameral pressure, potentially exerting force against the temporary restoration, thereby compromising its marginal seal and risking dislodgement or microleakage.[22]

Resin composites are used to meet patients aesthetic needs, but achieving a colour match can be challenging due to limited shade options and factors like tooth type and age. New single-shade composites provide more stable and natural-looking results with improved translucency. Traditional composites require layering, which is time-consuming, technically challenging, and may cause gaps between layers.[23]

To optimize predictability and aesthetic result, most clinicians currently employ Digital Smile Design (DSD) and completely digital processes. Data over the past five years show that DSD—2D and 3D in combination with intraoral scanning, facial scanning, CAD CAM manufacturing, and mock-up is more precise, restores natural form, improves patient clinician communication, and provides outcomes congruent with both digital plan and final restorations. Two year follow up of the cases with use of DSD-guided porcelain veneers presented an acceptable clinical performance.[24]

Longevity of direct composite veneers employed to improve small tooth size is subject to wear, chipping, discoloration, and marginal fracture. But when employed after an internal bleaching procedure that has stablilized (most commonly waiting 2–4 weeks for colour rebound to stablilize), stratification of composite with enamel and dentine shades provides acceptable aesthetics and preserves marginal integrity in two-year follow-ups. The direct approach is particularly suited where little preplanning is required and where immediate correction of discrepancy of tooth size is essential, although routine maintenance and polish are required..[22]

## CONCLUSION

Internal bleaching is a conservative and effective way to treat intrinsic tooth discoloration, often caused by retained endodontic materials like zinc oxide–based sealers. Hydrogen peroxide is the main bleaching agent used, with a glass ionomer cement barrier placed to protect against cervical resorption. Calcium hydroxide may be applied before final restoration to enhance results. While color matching with resin composites can be difficult, newer single-shade composites and digital smile design improve aesthetics and treatment predictability. Combining internal bleaching with direct composite veneers offers durable, natural-looking outcomes with minimal tooth preparation.

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