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FROM RECOVERY TO AESTHETICS: A CASE OF INTERNAL BLEACHING ASSOCIATED WITH COMPOSITE RESIN VENEER.

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Case Report

ABSTRACT

Introduction: Aesthetic dental enhancement has become increasingly relevant, gaining prominence and importance, with symmetry, shape, contour, and especially color playing a crucial role. In this context, chromatic alteration of the teeth, resulting from numerous factors, is one of the main reasons for dissatisfaction with the aesthetics and harmony of the smile, leading to methodologies that seek to restore dental naturalness in a conservative manner. **Aim**: This study aims to highlight, through a clinical case of a young patient, the aesthetic rehabilitation of a post-trauma upper lateral incisor, through endodontic treatment, followed by dental whitening and direct composite resin veneer. **Case report**: Conservative treatment through endodontics of the tooth, internal whitening with 20% sodium perborate, in-office whitening with 35% hydrogen peroxide, and after 7 days of stabilization, composite resin veneer for dental harmony. Discussion: The success of the treatment depends on the choice of material, accurate diagnosis, and proper execution of the technique. **Conclusion**: Conservative techniques are considered promising approaches for maintaining dental structure without the need for tooth structure removal to restore the aesthetic appearance of tooth darkening post-trauma.

Keywords: Tooth Bleaching, Dental Pulp Necrosis, Dental Restoration, Permanent.

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INTRODUCTION

Tooth discoloration has been a major aesthetic complaint among patients seeking dental treatment. This alteration not only affects aesthetics but can also impact social interactions by inhibiting one's smile[1]. Dental trauma is one of the primary causes of tooth discoloration, as factors such as hemorrhage, pulp necrosis, and bacterial proliferation contribute to this appearance in the dental structure[2-3].

Endodontic therapy is considered the most conservative treatment method. By removing necrotic tissue and filling the root canal system, it is possible to prevent bacterial development[3]. Regarding post-trauma aesthetic outcomes, internal whitening has been the most recommended treatment for discolored teeth. It is considered an effective and minimally invasive method[4]. The whitening effect results from the action of oxidizing agents that react with the macromolecules responsible for tooth pigments. Through an oxidation process, organic materials are converted into compounds with lower molecular weight, resulting in carbon dioxide and water. This process removes the pigment from the dental structure through diffusion, achieving a whitening effect[4.]

There are three types of whitening techniques: Immediate (Power Bleaching), Intermediate (Walking Bleaching), and Mixed, with possible combinations of these techniques[5]. In the Immediate technique, the preferred whitening agent is 35% hydrogen peroxide, applied simultaneously to the tooth's vestibular surface and the pulp chamber, and removed in the same session[6]. The time should always be monitored according to the manufacturer[7]. In the Intermediate technique, the agent is placed only in the pulp chamber, using 20% sodium perborate, combined with 20% hydrogen peroxide, followed by cavity sealing and weekly changes. This process may be repeated for up to three sessions[6.]

The optimal treatment should be determined based on each patient's needs. In some cases, endodontic treatment combined with whitening techniques may not achieve satisfactory results, necessitating the use of direct or indirect restorative techniques to restore dental harmony[8]. However, considering the importance of preserving dental structure, composite resin veneers are often the preferred technique[9]. They can effectively restore dental aesthetics while preserving healthy

structure without the need for excessive removal, offering the best cost-benefit ratio compared to other indirect materials[9].

In light of the above, this study aims to describe a clinical case utilizing conservative techniques through endodontic treatment, dental whitening, and aesthetic rehabilitation with composite resin in a post-trauma tooth, focusing on the protocol used in each treatment and discussing its inherent aspects.

CASE REPORT

Patient, 49 years old, female, with melanoderma, presented to the dental clinic at UniFTC-Salvador with complaints about the darkened appearance and irregular shape of her smile. This case report was submitted to the Ethics and Research Committee of the same institution, under number: CAAE: 57321822.5.0000.5032. Upon conducting the clinical examination, a color alteration was observed in tooth 22, and the patient reported a history of trauma in childhood following a fall, along with the absence of some dental units and the need for oral cavity adjustment (Figure 1).

Figure 1: Initial aspect.

After a periapical radiographic examination, a lesion was observed at the apex of the discolored tooth (Figure 2). A pulp vitality test was performed, which yielded a negative response, leading to a diagnosis of pulp necrosis.

Figure 2. Initial radiographic appearance of unit 22.

Considering the clinical aspects and aiming for a more conservative treatment plan, an agreement was reached with the patient through the Informed Consent Form (ICF): endodontic treatment of tooth 22, oral cavity adjustment, followed by internal whitening, in-office and at-home supervised whitening, and composite resin veneer if necessary.

Given the clinical condition, endodontic treatment was suggested in three sessions following this protocol: 1st session - coronal opening of tooth 22 and manual system instrumentation; 2nd session - intracanal medication with calcium hydroxide; and 3rd session - root filling using the lateral condensation technique and cavity sealing with Cotosol (COLTENE, Bonsucesso, Rio de Janeiro-RJ, Brazil) and glass ionomer cement (GIC) (Maxxion R, FGM, Joinville, SC - Brazil). After 11 months of follow-up, the patient exhibited no symptoms, and periapical radiographic examinations revealed regression of the periapical lesion (Figure 3).

Figure 3. Radiographic appearance of unit 22 after 11 months following the completion of endodontic treatment.

Before starting the whitening protocol, oral cavity adjustment was performed with supragingival scaling. Additionally, initial color recording was done using the color scale (VITA Classical A1 – D4), where for tooth 22, the color recorded was C4 (Figure 4).

Figure 4. Initial color assessment of unit 22.

To follow the internal whitening protocol, absolute isolation of tooth 22 was performed using clamp 211 to remove the filling material (Figure 5a). Then, the clinical crown length was measured buccally with a millimeter periodontal probe, defining a length of 10 mm, plus an additional 3 mm beyond the cervical margin to access the root

canal (Figure 5b). Once the length was established, a large bur compatible with the canal dimensions was selected and inserted 13 mm to remove the filling material from the root canal, as measured (Figure 5c). After the obstruction was cleared, the pulp chamber was cleaned with 70% alcohol.

Figure 5. Obstruction removal protocol. a) Absolute isolation of unit 22 with clamp 211; b) Measurement to determine the length of the crown; c) Removal of root canal filling with a wide drill.

After preparing the pulp chamber, a cervical barrier was created with a provisional filling cement (GIC) 3 mm below the cervical margin, at the enamel-cementum junction (Figure 6a). The intermediate internal whitening technique (Walking Bleach technique) was then performed using 20% Sodium Perborate (Whiteness Perborato Sódio FGM, Joinville, SC - Brazil), mixing 2 portions of the perborate powder with 1 drop of hydrogen peroxide solution. The mixture was applied inside the pulp chamber until it filled 2/3 of its volume (Figure 6b). Subsequently, a small ball of cotton was placed to remove moisture, and finally, the cavity was sealed with a provisional restoration using GIC (Figure 6c).

Figure 6. Application protocol for the indirect whitening technique. a) Cervical barrier with calcium hydroxide; b) Whitening material inside the pulp chamber; c) Temporary restoration with calcium hydroxide.

The whitening material remained in the cavity for 7 days. After this period, it was replaced 3 times, up to the maximum limit of 4 sessions, after which the material was completely removed from the cavity. The cavity was cleaned and sealed with composite resin (Vittra by FGM, Brazil). After 7 days, a new color measurement was taken (Figure 7), showing a slight change in color from the initial C4 to A4 following the internal whitening.

Figure 7. Shade assessment after internal bleaching of Unit 22.

To achieve a more satisfactory and harmonious result, an in-office whitening protocol was started in conjunction with supervised at-home whitening. For this, the color of the other teeth was recorded, resulting in the following shades: A2 (11, 41), A3 (13, 23, 33, and 43), A1 (21), and A4 (22) (Figure 8).

Figure 8. Initial shade recording of dental units. a) Unit 11 (A2); b) Unit 21 (A1); c) Unit 13 (A3);

d) Unit 23 (A3).

To initiate the in-office and supervised at-home whitening, prophylaxis was first performed using pumice-based paste (ASFER Indústria Química Ltda., Santa Maria, São Caetano do Sul – SP, Brazil) and water with a Robson brush (CA Reta Branca Avulsa – Microdont, Brazil) on all dental surfaces. A preliminary impression was then taken to create custom trays from acetate.

Next, a 2% desensitizing gel (Sensitivity 2%, Iodontosul, Porto Alegre - RS, Brazil) was applied for 10 minutes on the surfaces that would receive the whitening gel (Figure 9a). After this period, the desensitizing gel was removed, and a gingival barrier (Top Dam, FGM, Joinville, SC - Brazil) was applied to protect the mucosa and was light-cured for 20 seconds (Gnatus, 1000 mw/cm²) (Figure 9b).

The in-office whitening consisted of applying 35% Hydrogen Peroxide (Whiteness HP 35%, FGM, Joinville, SC - Brazil) in 3 sessions of 15 minutes each (Figure 9c). At the end of the 3rd session, the whitening gel was completely removed, and a neutral colorless fluoride gel (Flugel – DFL, Brazil) was applied to the clean surface.

Figure 9. In-Office bleaching gel application protocol: a) Application of desensitizing gel; b) Application of gingival barrier with Top Dam and light curing for 20 seconds; c) Application of bleaching gel for 15 minutes.

During the intervals between in-office whitening sessions, the patient was instructed on the use of the supervised at-home whitening tray, which was carried out with 22% Carbamide Peroxide (Whiteness Perfect 22%, FGM, Joinville, SC - Brazil) applied for 2 hours per day over a period of 15 days. The patient was also advised to discontinue the use of the whitening gel 2 days before the next in-office whitening session, which was performed 20 days after the first session.

Upon completion of the whitening protocol, a color stabilization period of at

least 10 days was observed, and a new color measurement was taken for tooth 22 (Figure 10) and the other teeth (Figure 11). A satisfactory result was achieved for all the whitened teeth. Based on this, planning for replacement/restorative procedures was carried out.

Figure 10. Final shade assessment of unit 22 after bleaching treatment.

Figure 11. Final shade assessment after bleaching treatment: a) Unit 11 (A1); b) Unit 21 (B1); c) Unit 13 (A2); d) Unit 23 (A2).

On intraoral clinical examination, the presence of an unsatisfactory restoration on the incisal edge, Class IV, of tooth 11 was noted. Contour and shape adjustments were made to the existing restoration. A palatal silicone guide (Zhermack SpA – Via

Bovazecchino, 100 – 45021 Badia Polesine (RO), Italy) was then created to facilitate the replacement of the composite resin restoration for this tooth. Prior to the restorative procedures, the resins were selected based on the dental structure, resulting in the following choices: for tooth 11, EA1 (Vittra APS, FGM, Joinville – SC/Brazil) and DA1 (Vittra APS, FGM, Joinville – SC/Brazil); and for tooth 22, EA2 (Filtek Z350XT Resin – 3M, Sumaré, SP/Brazil) and DA3O (Forma Resin – Ultradent, Indaiatuba, SP/Brazil).

After prophylaxis with pumice, absolute isolation was performed and the unsatisfactory incisal edge restoration of tooth 11 was removed (Figure 12a) using a diamond bur. The previously made palatal guide was tested (Figure 12b).

The restorative protocol began with protecting adjacent teeth with isolation tape (Isotape, TDV, Pomerode, SC/Brazil) and applying phosphoric acid (ALLPLAN, ÁCIDO-P GEL, Aparecida, SP/Brazil) for 30 seconds to the enamel, followed by rinsing for twice the time and drying. The universal adhesive (AMBAR APS, FGM, Joinville, SC/Brazil) was then applied to the surface and light-cured for 20 seconds.

To initiate the restorative protocol, the isotape was removed, and the first layer of enamel resin (EA1) was applied using the guide and light-cured to form the palatal shell (Figure 12c). Next, the dentin layer (DA1) was applied and also light-cured, followed by a final layer of enamel resin (EA1), completing the restoration of the incisal edge (Figure 12d) and a light adjustment and pre-polishing (Figure 12e). Additionally, carious tissue was removed and Class III restorations of teeth 22 and 23 were replaced. For the following session, the protocol for the veneer on tooth 22 was planned.

Figure 12. Incisal edge restoration protocol for unit 11. a) Removal of unsatisfactory resin and creation of a bevel on the vestibular surface; b) Testing of the palatal barrier; c) Fabrication of the palatal shell using the palatal barrier; d) Appearance after completion of the incisal edge restoration; e) Final appearance after adjustments and pre-polishing.

With the resin pre-selected, the entire protocol of absolute isolation and protection of adjacent teeth was completed for the fabrication of the veneer on tooth 22 (Figure 13a). Acid etching was then performed with 37% phosphoric acid for 30 seconds on the enamel (Figure 13b), followed by rinsing for twice the time to remove all the acid and drying. Afterward, the universal adhesive was applied to the previously demineralized enamel using a microbrush (APLIK, Angelus, Londrina, PR/Brazil) (Figure 13c), and then light-cured for 20 seconds.

The protocol continued with the application of the first dentin increment (A3O) over the entire buccal surface (Figure 13d) using a spatula, and the increment was light-cured for 40 seconds according to the manufacturer's recommendation. Finally, the last layer of composite resin, which was enamel (A2) (Figure 13e), was applied over the dentin layer, following the same light-curing protocol as for the dentin layer.

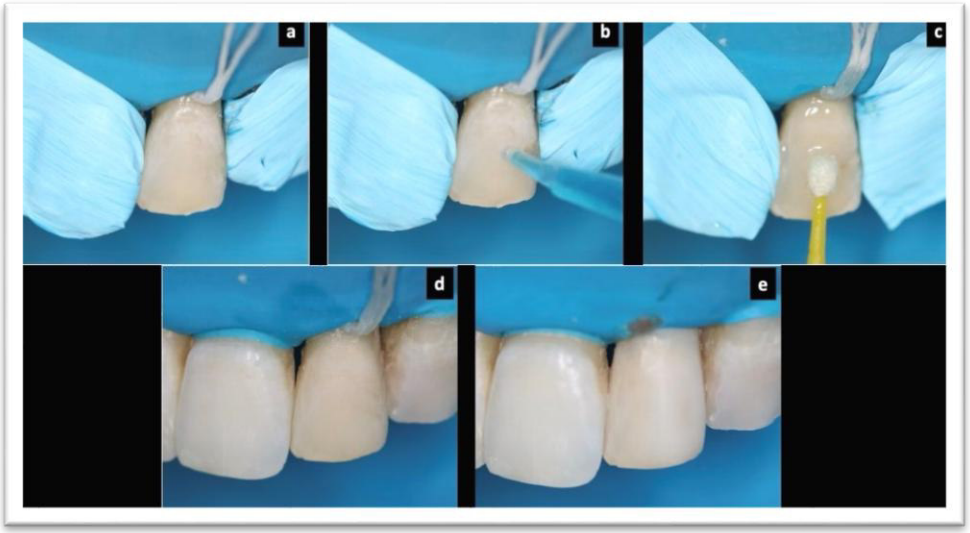

Figure 13. Composite veneer fabrication protocol for unit 22: a) Exposure of the unit and protection of adjacent teeth with isotape; b) Application of 37% phosphoric acid for 30 seconds on the entire enamel surface; c) Application of universal adhesive over the entire surface; d) Application of dentin resin layer DA30; e) Application of enamel resin layer EA2.

After 48 hours, the patient returned to the clinic for finishing and polishing of the restorations. This was done using flexible finishing discs (TDV, Pomerode, SC/Brazil), following a sequence from coarse to fine granulation, and finishing with the Ultra-Gloss composite resin polishing kit (American Burs, Cidade Universitária Pedra Branca, Palhoça, SC/Brazil). The final recording of the protocol was completed (Figure 14).

Figure 14. Final clinical appearance of the smile after rehabilitative planning.

DISCUSSION

In contemporary dentistry, a harmonious smile has become increasingly sought after, with significant emphasis on aesthetic standards. Among conservative and minimally invasive treatments, teeth whitening has gained considerable importance due to its safety and aesthetic results[10].

Among the immediate (Power Bleaching) and mediated (Walking Bleaching) techniques, where the whitening agents work through oxidative actions to alter dental pigmentation[11], the Walking Bleach technique was selected for this case. This method uses sodium perborate as the whitening agent[11]. Sodium perborate offers better control and safety compared to peroxide application, which, poses several risks when used on non-vital teeth. These risks include diffusion of hydrogen peroxide into dentinal tubules, alteration of dentin structure and permeability, overall decline in the physical properties of dental hard tissues, tooth fracture during treatment, excessive whitening, potential relapse, and, most notably, external cervical root resorption[11].

Some studies report that this resorption occurs because osteoclasts adapt to

acidic environments. Hydrogen peroxide, with a pH value of 2-3 at 30% concentration, can lead to such issues, while sodium perborate has a pH between 10-12, making it a better alternative. Sodium perborate can also be combined with low concentrations of hydrogen peroxide to mitigate pH changes and reduce the risk of external root resorption[10.]

Regardless of the technique used, to minimize potential risks such as the leakage of whitening material into dentinal tubules, 3 mm of the obturating material was removed below the cementoenamel junction, and a cervical barrier with temporary obturating material was constructed[10]. In this case, sodium perborate was combined with hydrogen peroxide, which can also be mixed with distilled water. There are no significant differences between using distilled water or hydrogen peroxide, except in cases of severe discoloration where hydrogen peroxide is more effective. Additionally, whitening vital teeth can help harmonize the smile and restore patient self-esteem, with 37% hydrogen peroxide used as the whitening agent[12.]

Despite the use of whitening agents, some color alteration of the endodontically treated tooth was observed. Note that when whitening agents do not equalize the tooth substrate with adjacent teeth, restorative techniques may be necessary to achieve the desired result[13]. Therefore, a direct composite veneer was required to ensure a less invasive approach to achieving harmony and uniformity among the teeth. This technique is more cost-effective compared to other materials, is less invasive, can be completed in a single session, and aims to improve aesthetics in terms of color, shape, or position while maintaining functional stability[14-15-16].

It is crucial for the dentist to be well-versed in the technique and material used to achieve the best aesthetic outcome[16], and to employ minimally invasive techniques. In this case, both direct and indirect restorative techniques were considered. Indirect techniques, such as ceramic veneers, offer greater color durability, abrasion resistance, and strength but come with higher costs and preparation time compared to direct composite resin techniques, which are more cost-effective, quicker, and preserve more dental structure. Given these considerations and the patient's socioeconomic conditions, the direct composite technique was chosen[12]. Discolored substrates do not affect the color of direct composite veneers over time[14].

To enhance the quality of composite resins and consequently the restorations performed with the direct technique, significant advancements have been made. Nowadays, nanofilled composites are available, offering excellent longevity, resistance, polish, and superior physical and optical properties, resulting in durable and high-quality aesthetics[17]. After completing the whitening protocol and waiting for 10 days, as it is not recommended to perform restorative procedures immediately after whitening due to residual oxygen affecting the aesthetic result[18], the direct composite veneer technique proved to be a predictable procedure. It offers satisfactory aesthetic and quality results at a lower cost, and in cases where future modifications are needed, it allows for changes without compromising the dental structure. Composite resins offer minimal to no structural alteration, preserving dental substrate and achieving an aesthetic appearance similar to the natural tooth. The success of the treatment depends on the choice of material, accurate diagnosis, and proper execution of the technique[19-20-21].

FINAL CONSIDERATIONS

Color alteration is a common complaint in dental practice. The use of conservative techniques for the rehabilitation of anterior teeth, as demonstrated in this case, shows that internal bleaching combined with direct composite veneers can be effective. This approach provides aesthetic and functional harmony when executed properly, with careful diagnosis and treatment planning being crucial to achieving satisfactory results.

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