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Modified Technique for Vital Bleaching of Teeth Pigmented by Amalgam: A Case Report

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Clinical Relevance

This technique provides an esthetic, and conservative alternative to the mechanical removal of amalgam pigmentation.

SUMMARY

The aim of this study was to describe a technique and report the success of a clinical case in which a modified technique of in-office bleaching with hydrogen peroxide at 35% was performed for two sessions in a premolar pigmented by amalgam followed by placement of a posterior direct composite resin restoration.

INTRODUCTION

The question of esthetics is a major concern in dentistry today. Changes in the smile present surprising effects on the self-esteem of an individual, especially in a society where looks come first. The color of the teeth, despite being one of several factors contributing to the esthetic balance of a smile, is the single most important factor in this balance, as the harmony of color is perceived more immediately and quickly than other cosmetic anomalies.[1]

The tooth is a combination of elements, and its color is set by the dentin, resulting in a yellow color for permanent teeth. Over the years, the enamel undergoes wear, and in turn, the dentin becomes thicker by the deposition of reparative layers, making the teeth darker, a phenomenon called physiologic browning.[1,2]

The techniques of teeth whitening are conservative alternatives to be considered as a first choice for the esthetic treatment of changing the color of teeth. However, the teeth to be subjected to bleaching typically maintain their shape, contour, and surface texture.[1,2]

Amalgam restorations, in addition to being unsightly, can cause undesirable pigmentation of the tooth structure. The silver amalgam is an alloy and

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subject to corrosion. This type of pigmentation, corrosion inside the tooth, is difficult to remove.[1,3-5]

Bleaching of vital teeth removes extrinsic and intrinsic stains by the release of oxygen that penetrates into the tubules and acts on the molecules of carbon pigment. This bleaching is performed with the bleaching gel located on the external surface of the tooth, in direct contact with the tooth enamel.[2]

The process of dental browning occurs because of the formation of chemically stable structures responsible for the progressive darkening in color. The bleaching process involves oxidation, in which organic materials are converted into carbon dioxide and water. The pigments composed of carbon molecules are broken down and converted into smaller compounds, which are lighter in color. The saturation point is the point in time when the maximum whitening is achieved. From this stage, the pigments are no longer bleached, and the bleaching agent begins to act on other carbon compounds, such as enamel matrix proteins. At this point, there is loss of tooth structure. Therefore, the clinician needs to know when to stop the process, because all of the esthetic benefits of bleaching are lost when tooth structure is lost.[6,7]

To have success with teeth whitening, professionals should have knowledge of the probable diagnosis of color change and the mechanism of action of the whitening substance, and they should provide an efficient and safe technique. By doing so, it is possible to obtain a favorable outcome of equality and harmony of color, restoring the esthetics of the smile.[7,8]

CLINICAL CASE REPORT

A female patient, 40 years of age, presented to the Integrated Clinic, Faculty of Dentistry, Federal University of Rio de Janeiro for a routine checkup. The patient had complaints regarding the esthetic harmony of her smile. Upon clinical examination, a marked darkening of the maxillary first left premolar was noted. This tooth had an occlusal amalgam restoration. (Figure 1) A periapical radiograph was taken, which demonstrated that the amalgam restoration was shallow and that the tooth had normal periradicular structures. Therefore, a treatment plan was established to replace the restoration and perform bleaching as conservative esthetic procedures.

The first procedure was performed under local anesthesia in the region of the tooth being treated. Absolute isolation was placed. The total removal of

Figure 1. *Initial.*

Figure 2. *Exposed surfaces of the tooth.*

the amalgam restoration was performed using a diamond-shaped bur, and both enamel and dentin were exposed. (Figure 2) Bleaching was performed using 35% hydrogen peroxide gel on the exposed surfaces of the tooth. The gel was handled according to the manufacturer's instructions. On that first visit, there were three applications of the bleaching agent for 15 minutes each. With each gel application, the tooth was thoroughly washed with air/water spray. After the last application, the tooth was cleaned with water and dried with air jets, and a temporary filling was placed. After seven days, bleaching was performed again, as described above.

After seven days from the end of the second session of bleaching, a composite resin restoration (opaque as dentin and translucent as enamel, OW and T-Neutral Opallis, FGM) was placed using the incremental technique. A conventional two-step adhesive system was used, in which etching was performed for 30 seconds on enamel and 15 seconds on dentin, copious irrigation was used to remove the etchant, excess moisture was removed with absor-

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Table 1: *Material list*	
Diamond bur n1046 (diamond bur in the form of reel)	KG Sorensen, SP-Brazil
Condac 37 (phosphoric acid gel 37%)	FGM, SC-Brazil
Cavibrush (disposable applicator type microbrush)	FGM, SC-Brazil
Adper Single Bond 2 (conventional each and rinse two-step adhesive system)	3M ESPE, SP-Brazil
Composite Opallis OW (opaque) e T-Neutral (translucent)	FGM, SC-Brazil
Whiteness HPmaxx (35% hydrogen peroxide gel)	FGM, SC-Brazil
Coltosol (Zinc oxide, zinc sulphate–hydrated, calcium sulphate–hemihydrated, diatomaceous earth, dibutyl phthalide, copolymer–polyvinyl chloride, mint flavor)	Vigodent, RJ-Brazil
Diamond master (diamond paste for composite polishing)	FGM, SC-Brazil
Finishing diamond burs for composites kit F and FF (burs fine and ultrafine for composite finishing)	KG Sorensen, SP-Brazil

bent paper balls, and the adhesive system was placed using a disposable applicator. Excess adhesive was removed with a dry disposable applicator, and the adhesive was allowed to sit for 20 seconds to allow the solvent to evaporate. The adhesive was light polymerized for 20 seconds.

Opaque resin increments were inserted in two steps, and each increment was light cured for 40 seconds. Two increments of translucent resin were then placed in two steps and photo activated. Occlusal adjustment was performed, and the restoration was finished with fine diamond burs and polishing discs with extra-fine grain and a felt disc with diamond paste (Table 1 Figures 3 and 4).

RESULTS

After performing the whitening procedures and replacing the amalgam restoration with resin composite, there was a significant reduction of black pigmentation caused by the penetration of corrosion products into the tubules, leading to a significant brightening of the tooth. There were no reports of postoperative sensitivity immediately after completion of treatment. After one and two years, the tooth remained asymptomatic, without causing any significant change in tooth color, thus ensuring the stability of the proposed esthetic treatment. (Figures 5-8)

Figure 3. *Restoration completed.*

Figure 4. *Immediate final.*

Figure 5. *After 1 year.*

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Figure 6. *After 2 years.*

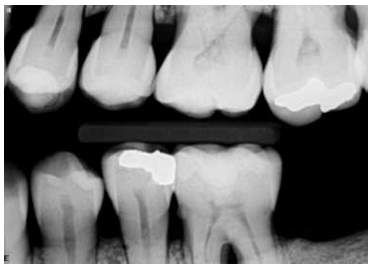

Figure 7. *Bite-Wing after 2 years.*

Figure 8. *Periapical radiograph after 2 years.*

Potential Problems

- Sensitivity during and after procedures.[9-11] According to the literature, approximately 70% of patients undergoing whitening claim to have had sensitivity (during and/or postoperative), mainly in anterior teeth.[9]
- Adverse biological effects. It can be stated that the toxicity of bleaching procedures is mainly associated with two factors: the concentration of hydrogen peroxide and the contact time of the gel with the tooth surface. The more applications of the gel on the tooth, the greater the toxic effects of the procedure.[10-12]

Considerations

The available research in this area seems to support the safe use of hydrogen peroxide bleaching of vital teeth when it is a supervised medical procedure. The most important points of safety are that the whitening products do not induce major structural changes in enamel and the dentin bonding procedures must be postponed for at least 24 hours after the whitening procedure. Dentin sensitivity is an important adverse reaction, which reflects reversible pulpits, since no studies have reported irreversible pulpits. Also, there is no evidence of toxic or carcinogenic risk to humans when exposed to hydrogen peroxide gel.[13]

The cytotoxic effects of 35% hydrogen peroxide occur after only three consecutive sessions, by a process of dissemination of the gel components through enamel and into dentin, causing severe cytotoxic effects on pulpal cell cultures.[14]

In an *in vivo* study, the pulp response of healthy human premolars after being subjected to vital bleaching gel with 38% hydrogen peroxide with or without the application of light was microscopically examined. In almost all experimental teeth, the pulp tissue showed histological features of normality. Only one sample in each group showed dilated and congested blood vessels between a discrete number of inflammatory cells. These specimens had a slight disorganization of the odontoblast layer. The vital bleaching with hydrogen peroxide at 38% with or without activation by light caused no damage to the pulp tissue of healthy human premolars.[15]

Besides sealing the access cavity, an ideal provisional material should be resistant to mechanical forces and thermal changes, be nontoxic, and not affect future bonding of restorative materials to the tooth structure. No material should be recommended as superior in providing a reliable seal after 14 days.[16] Glass ionomer cement and Coltosol showed the lowest mean values of coronal microleakage when used to seal the pulpal access cavity after endodontic treatment. Both are suitable as temporary restorative materials but should not be used for more than one or two weeks.[17] A study evaluated microleakage at the interface between various temporary restorative materials (Coltosol, IRM, and CLIP) and existing amalgam or composite restorations and dental tissues in previously re-

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stored teeth after partial removal of the restoration. In almost all groups, lower microleakage values were observed in temporary restoration–permanent restoration interfaces compared with temporary restoration–tooth interfaces.[18]

Advantages

- Conservative treatment
- Low cost for direct restorative procedures
- Obtaining an acceptable esthetic result

Limitations

- Cross-sensitivity and postoperative sensitivity may be generated.[9-11]
- The restoration can be performed only after at least 24 hours post-bleaching, as the release of oxygen from the bleaching gel interferes with the adhesion of resin to dental substrates.[10,11]

CONCLUSION

- This technique was an esthetic and conservative alternative to the mechanical removal of amalgam pigmentation.
- This procedure is a simple and efficient way to increase the self-esteem of the patient.

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REFERENCES

1. Baratieri LN (2001) Whitening of teeth. In: Baratieri LN (ed) *Restorative Dentistry: Principles and Possibilities* Santos, São Paulo, Brazil 673-722.
2. Vieira D (2003) *Dental Bleaching* Santos, São Paulo, Brazil.
3. Anusavice KJ (2005) *Phillips, Dental Materials* Elsevier, Rio de Janeiro, Brazil.
4. Stephen HY, & Ingram MJ (1969) Analyses of the amalgam-tooth interface using the electron microprobe *Journal of Dental Research* **48(2)** 317-320.
5. Scholtanus JD, Ozcan M, & Huysmans M, CDNJM (2009) Penetration of amalgam constituents into dentine *Journal of Dentistry* **37(5)** 366-373.
6. Lima MJP, & Araujo PRC (2006) Study *in vitro* bleaching action of hydrogen peroxide at 35% *Journal of Dental Science - Fac Odonto/PUCRS* **21(54)** 376-386.
7. Joiner A (2006) The bleaching of teeth: A review of the literature *Journal of Dentistry* **34(7)** 412-419.
8. Catão CDS, Duarte SMO, Machado CT, Seabra BGM, & Barros HP (2007) Technique and precaution for the success of the endogenous bleaching: Description of a clinical case *Dentistry Clínical Scientific Recife* **6(4)** 339-343.
9. Costa CAS, Riehl H, Kina JF, Sacono NT, & Hebling J (2010) Human pulp responses to in-office tooth bleaching *Oral Surgery Oral Medicine Oral Pathology Oral Radiology Endodontic* **109(4)** 59-64.
10. Tredwin CJ, Naik S, Lewis NJ, & Scully CBE (2006) Hydrogen peroxide tooth-whitening (bleaching) products: Review of adverse effects and safety Issues *British Dental Journal* **200(7)** 371-376.
11. Dahl JE, & Pallesen U (2003) Tooth bleaching—A critical review of the biological aspects *Critical Reviews in Oral Biology & Medicine* **14(4)** 292-304.
12. Costa CAS (2009) Indirect cytotoxicity of a 35% hydrogen peroxide bleaching gel on cultured odontoblast-like cells *Brazilian Dental Journal* **20(4)** 267-274.
13. Minoux M, & Serfaty R (2008) Vital tooth bleaching: Biologic adverse effects—A review *Quintessence International* **39(8)** 645-659.
14. Trindade FZ, Ribeiro APD, Sacono NT, Oliveira CF, Lessa FCR, Hebling J, & Costa CAS (2009) Trans-dentinal and trans-enamel and cytotoxic effects of 35% H2O2 bleaching gel on cultured odontoblast cell lines after consecutive applications *International Endodontic Journal* **42(6)** 516-524.
15. Kina JF, Huck C, Riehl CH, Martinez TC, Sacono NT, Ribeiro APD, & Costa CAS (2010) Response of human pulps after professionally applied vital tooth bleaching *International Endodontic Journal* **43(7)** 572-580.
16. Hartwell GR, Loucks CA, & Reavley BA (2010) Bacterial leakage of provisional restorative materials used in endodontics *Quintessence International* **41(4)** 335-339.
17. Madarati A, Rekab MS, Watts DC, & Qualtrough A (2008) Time-dependence of coronal seal of temporary materials used in endodontics *Australian Endodontic Journal* **34(3)** 89-93.
18. Tulunoglu O, Uctasli MB, & Ozdemir S (2005) Coronal microleakage of temporary restorations in previously restored teeth with amalgam and composite *Operative Dentistry* **30(3)** 331-337.

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