REVIEW ARTICLE

NON-VITAL BLEACHING TECHNIQUE OF DISCOLOURED TOOTH: A NARRATIVE REVIEW

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ABSTRACT

Today, the bleaching of nonvital, discoloured teeth is a low-risk routine treatment for improving aesthetics. Depending on the situation, the walking bleach technique can be an uncomplicated, minimally invasive and convenient treatment modality for both patients and dentists. This review article focuses on the aetiology of tooth discolorations, different treatment techniques of non-vital bleaching, indications, contraindications of bleaching procedures, procedural steps of walking bleaching in detail and adverse effects.

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INTRODUCTION

In modern society there is a growing concern for beauty and perfect looks than ever before. In particular, the "perfect smile" has gained popularity, including the light-colored teeth. Vital tooth bleaching aims to lighten the entire arch while nonvital bleaching procedures are used to treat discolored teeth as they blend in with the adjacent teeth. Intracoronal bleaching, also known as non-vital bleaching, has been around since 1848[1], when chloride of lime was placed inside the pulp chamber and used as an oxidizing agent. Since then, bleaching techniques for the management of the discolored tooth have evolved to increase safety and predictability.

ETIOLOGY OF TEETH DISCOLOURATION

Tooth discoloration can be induced by intrinsic stains incorporated in tooth structures and extrinsic stains deposited on tooth surfaces. This can be due to patient- or dentist-related causes[2]. Correct diagnosis of the etiology of discoloration is important for treatment planning and outcome assessment.

Common causes are listed below:

a) Intrapulpal hemorrhage following trauma, where blood enters the dentinal tubules and decomposes resulting in deposition of chromogenic blood degradation products, such as hemosiderin, hemin, hematin and haematoidin.

b) Pulpal necrosis leading to chromogenic degradation products

c) Root canal cement or gutta percha remaining in the coronal portion of the pulp chamber

d) Failure to completely remove the pulp and pulp horns

e) Combining sodium hypochlorite, even at low concentrations, and chlorhexidine during irrigation, may result in formation of brownish-red precipitate

f) Dental caries

g) Failing or leaking coronal restorations

h) Cervical resorption

I) Calcific metamorphosis

j) Enamel hypoplasia/ hypomineralisation defects resulting from disturbances to the developing tooth germ

k) Malaligned /inward placed tooth which due to an increased susceptibility to extrinsic staining and shadowing, may appear discoloured.[3]

INDICATIONS FOR BLEACHING

1. Discolorations of pulp chamber origin
2. Dentine discolourations[4]
3. Discolorations resulting from calcific metamorphosis
4. Enamel hypoplasia/ hypomineralisation.[3]

CONTRAINDICATIONS FOR BLEACHING

1. Pregnancy and breastfeeding
2. Patients with unrealistic expectations regarding the aesthetic outcome
3. Patients exhibiting or with a history of extreme dental sensitivity
4. Insufficient coronal tooth tissue to allow sealing of bleaching material inside the pulp chamber
5. Teeth with deep surface cracks and fracture lines
6. Existing crowns or large restorations in the aesthetic smile zone
7. Teeth with caries and periapical lesions
8. Symptomatic teeth.[3]

Non-vital Bleaching

Bleaching is a treatment modality involving an oxidative chemical that modifies the light-absorbing and/or light- reflecting nature of a material structure, thereby increasing its perception of whiteness. In-office tooth bleaching using peroxide compounds has been practiced in dentistry for more than a century. Intra-coronal bleaching of endodontically treated teeth may be successfully carried out

1.Figure 1 A) A labial view demonstrating a discolored non-vital upper left central incisor, upon clinical and radiographic examination, incompletely obturated tooth with a persistent periapical lesion was observed. Pain and lesion subsided after re root canal treatment. Postoperatively in two months, nonvital bleaching was planned on the tooth with sodium perborate dihydrate powder; B) Labial view showing the tooth post-two weeks of intracoronal walking bleaching procedure and the desired outcome was obtained C) Post-operative radiograph of the discolored tooth.

with satisfying long-term esthetic results (Figure1). A successful outcome depends mainly on the etiology, correct diagnosis, and proper selection of bleaching technique[2 5 6]. The methods most commonly employed to bleach endodontically treated teeth are the "walking bleach" and the thermocatalytic techniques.

INITIAL CONSIDERATIONS

A detailed history, especially relating to the discolored tooth, is crucial to aid in the diagnosis of etiology of discolorations. Followed by a comprehensive extraoral and intraoral examination is required. The color and presentation of the discolorations may aid in the diagnosis. A comprehensive aesthetic evaluation must be undertaken. This must include an initial shade evaluation.

A good quality periapical radiograph is also required in cases of discoloration resulting from trauma, pulp necrosis or previous endodontic or root canal treatment. Radiographic assessment of previous endodontic treatment should also be used to aid in the assessment of the need for secondary endodontic treatment before bleaching. Prior to undertaking bleaching, existing carious lesions, periodontal disease and periapical pathology should be managed, as bleaching treatment can exacerbate existing periapical lesions.

Intraoral photography is also very useful when undertaking bleaching treatment. A labial view with a shade tab correlating to the darkest tooth, placed in the region of the canine is crucial and allows vital comparisons for the progression of bleaching treatment.

Walking Bleach Technique

In the early 1960s, several dentists realized that utilizing the pulp space in non-vital teeth for the placement of a bleaching agent could be advantageous. In 1961, Spasser[7] described a method of sealing in a mixture of sodium perborate with water into the pulp chamber and leaving it for a week. Nutting and Poe[8] described a modification of the technique in

1963, whereby Sodium Perborate and Hydrogen Peroxide were sealed into the tooth and used synergistically to bleach the tooth

In the walking bleach techniques, following barrier preparation the bleaching agent is placed into the tooth over the barrier. The tooth is sealed with an appropriate palatal restoration. The patient is evaluated on a two-weekly basis and the procedure is repeated as appropriate until the desired shade has been achieved.

Procedural Steps

Explain the patient with the possible causes of dis-coloration, the procedure to be followed, the expected outcome, and the possibility of future rediscoloration. Radiographically assess the status of the periapical tissues and the quality of endodontic obturation. Endodontic failure or questionable obturation should be retreated prior to bleaching.

Assess the quality and shade of any restoration present and replace if it is defective. Tooth discoloration is frequently the result of leaking or discolored restorations. In such cases, cleaning the pulp chamber and replacing the defective restorations should be done. Evaluate tooth color with a shade guide and, if possible, take clinical photographs at the beginning of and throughout the procedure. These provide a point of reference for future comparison. Isolate the tooth with a dental dam. The dam must fit tightly at the cervical margin of the tooth to prevent possible leakage of the bleaching agent onto the gingival tissue. Interproximal wedges and ligatures may also be used for better isolation.

Figure 2

Intracoronal bleaching of tooth discoloration due to pulp necrosis in a maxillary left central incisor A) Pre-treatment photograph. B). After 4 weeks of walking bleach with sodium perborate, the tooth regained its original shade. (courtesy: Dr Abijith R S, Post Graduate, Royal Dental College, Challissery)

Remove all restorative materials from the access cavity, expose the dentin, and refine the access. Verify that the pulp horns and other areas containing the pulp tissue are clean. Remove all materials to a level just below the labial gingival margin. Orange solvent, chloroform, or xylene on a cotton pellet may be used to completely dissolve sealer remnants to cover the endodontic obturation, apply a sufficiently thick layer, at least 2 mm, of a protective white cement barrier, such as polycarboxylate cement, zinc phosphate cement, glass ionomer, intermediate restorative material (IRM), white colored MTA. The coronal height of the barrier should protect the dentinal tubules and conform to the external epithelial attachment.[9] Prepare the walking bleach paste by mixing sodium perborate and an inert liquid, such as water, saline, or anesthetic solution, to a thick consistency of wet sand. Although sodium perborate plus 30% H_2O_2 mixture may bleach faster, in most cases, long-term results are similar to those with sodium perborate and water alone and therefore need not to be used routinely.[10,11,12,13] With a plastic instrument, pack the pulp chamber with the paste. Remove excess liquid by compressing with a cotton pellet. This also compresses and push the paste into all areas of the pulp chamber.

Remove the excess bleaching paste from undercuts in the pulp horn and gingival area and apply a thick well-sealed temporary filling (preferably IRM) straight against the paste and into the undercuts. To ensure a good seal, judiciously pack the temporary filling, at least 3 mm thick. Remove the dental dam and inform the patient that bleaching agents work in a slow manner and significant lightening may not be evident for several days.

Evaluate the patient 2 weeks later and, if necessary, repeat the procedure several times.[14,12] Repeat treatments are similar to the first one. As an optional procedure, if initial bleaching is not satisfactory, strengthen the

walking bleach paste by mixing sodium perborate with gradually increasing concentrations of H_2O_2 (3% to 30%) instead of water. The more potent oxidizers may have an improved bleaching effect but are not used routinely because of the possibility of permeation into the tubules and damage to the cervical periodontium by these more caustic agents. In such cases, a protective cream, such as Orabase or Vaseline, must be applied to the surrounding gingival tissues prior to dam placement. In most cases, discoloration will improve after one to two treatments. After three consecutive placements if there is no significant improvement, reassess the case for proper diagnosis of the etiology of discoloration and plan the treatment accordingly.

Inside/Outside Open Technique (IOO)

First described by Settembrini et al. in 1997[23], and later modified by Liebenberg et al.[24] this technique involves leaving the access cavity open following adequate barrier preparation and the patient directly applying the bleaching agent with a syringe into the access cavity and the bleaching tray. The bleaching tray is then seated into the mouth to cover the access cavity. The bleaching agent is subsequently replaced every 4-6 hours and the patient reviewed at 2-3 days to reassess the degree of lightening of the tooth.

The Inside/Outside Closed Technique (IOC)

This technique, first described by Haywood and DiAngelis in 2010,[25] is a modification of the inside/outside technique. The technique involves sealing the bleaching agent into the access cavity following appropriate barrier preparation, and then utilising a 'single tooth' bleaching tray, to apply the bleaching agent from the external surface. A palatal restoration is placed to seal the bleaching agent into the tooth. The bleaching tray is worn overnight until the desired shade is achieved or until the review appointment. Further re-application of the bleaching agent intracoronally can be undertaken at the review appointment, if needed.

Adverse Effects

High concentrations of H_2O_2 are caustic and cause chemical burns and sloughing of the gingiva. When using such solutions, the H_2O_2 concentration should be maintained as low as practically possible and the soft tissues should always be protected with Vaseline, Orabase, or cocoa butter. H_2O_2 at high concentration is not the agent of choice for routine intracoronal bleaching.

Oxygen inhibits resin polymerization; consequently, residual H_2O_2 in tooth structure after bleaching adversely affects the bonding strength of resin composites to enamel and dentin.[15,16] Scanning electron microscopy (SEM) examination has shown an increase in the resin porosity.[17] This presents a clinical problem when immediate esthetic restoration of the bleached tooth is required. It is therefore recommended that residual H_2O_2 should be totally eliminated prior to the placement of composite.

Clinical reports[18,19] and histological studies[22,21,22] have shown that intracoronal bleaching may, under certain conditions, induce external cervical root resorption. This is probably caused by the highly concentrated oxidizing agent used in those cases, particularly 30 to 35% H_2O_2.

CONCLUSION

Given the appropriate indication, the bleaching of nonvital teeth is a relatively low-risk intervention to improve the esthetics of endodontically treated teeth. Depending on the situation, the walking bleach technique can be an uncomplicated, minimally invasive and convenient treatment modality for both patients and dentists.

In-office bleaching can often only produce short-term success, based largely on the dehydration of the tooth. The risk of root resorption cannot be exactly determined by the available data. The ability to provide treatment with minimal biological side effects continues to make bleaching a first line choice in cases presenting with a single or multiple non-vital discolored tooth.

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