Tooth Bleaching- Home Bleaching Technique

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Introduction

Bleaching is a procedure which involves lightening of the color of a tooth through the application of a chemical agent to oxidize the organic pigmentation in the tooth.

Tooth discoloration varies in etiology, appearance, localization, severity, and adherence to tooth structure. It may be classified as intrinsic, extrinsic, and a combination of both (Hattab *et al.*, 1999). Intrinsic discoloration is caused by incorporation of chromatogenic material into dentin and enamel during odontogenesis or after eruption. Exposure to high levels of fluoride, tetracycline administration, inherited developmental disorders, and trauma to the developing tooth may result in pre-eruptive discoloration. After eruption of the tooth, aging, pulp necrosis, and iatrogenesis are the main causes of intrinsic discoloration. Coffee, tea, red wine, carrots, oranges, and tobacco give rise to extrinsic stain (Hattab *et al*., 1999; Watts and Addy, 2001). Wear of the tooth structure, deposition of secondary dentin due to aging (Watts and Addy, 2001) or as a consequence of pulp inflammation, and dentin sclerosis affect the light-transmitting properties of teeth, resulting in a gradual darkening of the teeth.

Scaling and polishing of the teeth remove many extrinsic stains. For more stubborn extrinsic discoloration and intrinsic stain, various bleaching techniques may be attempted. Tooth bleaching can be performed externally, termed **night guard vital bleaching** or vital tooth bleaching, or intra-coronally in root-filled teeth, called non-vital tooth bleaching.

Night Guard Vital Bleaching (NGVB) or dentist-monitored bleaching technique is probably the most widely used bleaching technique because of its relative ease of use, low cost, safety and high success rate. There are many non-vital bleaching techniques available, all of which have one thing in common, usually a successful result in the procedure returning the discolored tooth to its original colour and beyond that when required.

This article will give an overview of various home bleaching techniques: materials and regimens used, bleaching procedure and treatment of side-effects. In addition, it ill review various in-surgery and at home techniques used for bleaching non-vital teeth.

History

Bleaching of discolored, pulp less teeth was first described in 1864 (Truman, 1864), and a variety of medicaments such as chloride, sodium hypochlorite, sodium perborate, and hydrogen peroxide has been used, alone, in combination, and with and without heat activation (Howell, 1980). The "walking bleach" technique that was introduced in 1961 involved placement of a mixture of sodium perborate and water into the pulp chamber that was sealed off between the patient's visits to the clinician (Spasser, 1961). The method was later modified and water replaced by 30-35% hydrogen peroxide, to improve the whitening effect (Nutting and Poe, 1963). The observation that carbamide peroxide caused lightening of the teeth was made in the late 1960s by an orthodontist who had prescribed an antiseptic containing 10% carbamide peroxide to be used in a tray for the treatment of gingivitis (Haywood, 1991). The observation was communicated to other colleagues and must be regarded as the beginning of the night guard bleaching era. More than 20 years later, the method describing the use of 10% carbamide peroxide in a mouth guard to be worn overnight for lightening tooth color was published (Haywood and Heymann, 1989).

Medicaments: Tooth bleaching today is based upon hydrogen peroxide as the active agent. Hydrogen peroxide may be applied directly, or produced in a chemical reaction from sodium perborate or carbamide peroxide. Hydrogen peroxide acts as a strong oxidizing agent through the formation of free radicals, reactive oxygen molecules, and hydrogen peroxide anions. These reactive molecules attack the long-chained, dark-colored chromophore molecules and split them into smaller, less colored, and more diffusible molecules. Carbamide peroxide also yields urea that theoretically can be further decomposed to carbon dioxide and ammonia. It is unclear, however, how much ammonia is formed during tooth bleaching with carbamide peroxide. The high Ph of ammonia facilitates the bleaching procedure. This can be explained by the fact that, in a basic solution, lower activation energy is required for the formation of free radicals from hydrogen peroxide, and the reaction rate is higher, resulting in an improved yield compared with an acidic environment. The outcome of the bleaching procedure depends mainly on the concentration of the bleaching agent, the ability of the agent to reach the chromophore

molecules, and the duration and number of times the agent is in contact with chromophore molecules.

Method

Vital tooth bleaching can be performed at home and in-office. Four different approaches for tooth whitening have been recognized and reviewed by Barghi (1998):[1] dentist-administered bleaching—the use of a high concentration of hydrogen peroxide (from 35 to 50%) or carbamide peroxide (from 35 to 40%), often supplemented with a heat source;[2] dentist-supervised bleaching—by means of a bleaching tray loaded with high concentrations of carbamide peroxide (from 35 to 40%) that is placed in the patient's mouth for 30 min to 2 hrs while the patient is in the dental office;[3] dentist-provided bleaching— known as "at-home" or "night-guard" bleaching and administered by the patient applying from 5 to 22% solution of carbamide peroxide in a custom-made tray; and[4] over-the counter products, often based on carbamide peroxide or hydrogen peroxide of various concentrations and placed in a pre-fabricated tray, or by the recently introduced strips (Gerlach, 2000), both to be adjusted by the user.

Case Selection

The most important aspect of any form of bleaching is an assessment of the patient's expectations. To avoid problems, the first thing that should be established is the patient's level of expectation. When it becomes clear that the patient wants whiter teeth, the first question to the patient should be "What do you expect to achieve with this whitening procedure?" If the answer is, "A dazzling white smile" or film star teeth or words to that effect, use extreme caution when bleaching the teeth of such patients as they may never be satisfied! Pregnant patients should also be avoided as the effects of the bleaching materials on the foetus have yet to be fully investigated. Those patients that present with decay, periapical lesions, cracks and sensitivity should have these issues treated before any bleaching procedure is undertaken. Diagnosis of the cause of the discoloration should be made and recorded in the patient's notes. The options for treatment can be extrinsic stain removal, bleaching or both. Other options, such as veneers and crowns, should also be discussed with the patient and recorded in the notes. The teeth that are to be bleached should be identified and checked for:

- Vitality;
- Caries;
- Cracks;
- Recession, exposed dentine;
- Developmental defects such as white spots.

In addition, the presence of composite fillings, veneers, crowns or highly translucent teeth should be noted. Patients must be warned that these will not change shade but their margins may merely be cleaned up by the bleaching agent acting on the surrounding tooth structure. Hence, they may possibly need replacement following the bleaching treatment. Any teeth that require root canal therapy should have this carried out prior to the bleaching procedure. Following the assessment of the teeth, the shade should be agreed with the patient and recorded in the notes. A pre-operative photograph with the shade tab *in situ* should always be taken under standardized lighting conditions without using the dental operating light which would wash out the shade. After all the relevant explanations, options, limitations and prognosis have been discussed with the patient, a consent form should be signed and the patient should be referred for a hygiene session about a week to ten days prior to the bleaching procedure.

Procedure

Alginate or similar impression material may be used to take impressions for the manufacture of the bleaching trays. There are many different types of custom-made trays but broadly they are divided into those that have or do not have a reservoir. The function of the reservoir is to allow for a greater thickness of bleaching material to contact the buccal surface of the teeth to be bleached. There are no differences in the rate of bleaching with or without reservoirs, but reservoirs may be used to aid the seating of the more viscous bleaching materials or for patients with particularly bulbous teeth. Other variations in tray design include scalloping the tray borders to follow the tooth/gingiva interface so that there is minimal soft tissue contact and gingival irritation. However, the scalloping may irritate the lip or tongue and the ingress of saliva may wash out the bleaching gel from the tray. Straight line or non-scalloped trays may be cut about 2 mm over the labial incisors and may be easier to use and less traumatic to the rest of the mouth with a better border seal. Other tray variations include cutting back borders in cases that have pre-existing gingival recession or sensitivity, while windows are cut in trays over teeth that do not require bleaching. The bleaching tray thickness which is usually about 0.9 mm can be increased if the patient has a bruxing habit (1.5 mm) or made very thin for those that have a gagging tendency (0.5 mm).

- The patient is instructed on placement of a cotton wool pellet into the cavity when not undergoing the bleaching procedure and is asked not to eat on the tooth during the bleaching period.
- The custom-made bleaching tray is checked for fit and the patient is instructed to remove the cotton pellet with a tooth pick prior to placement of a small amount of bleaching agent directly into the cavity straight from the bleaching syringe. The space of the tooth on the bleaching tray is also filled with bleaching agent before the placement of the tray into the mouth. Alternatively, extra material is placed into the space of the tooth to be bleached on the tray and the material is massaged via the tray slightly into the pulp chamber and any excess removed using a cotton bud or toothbrush.
- Following a 2-hour bleaching session, the patient irrigates the cavity with water using a syringe provided before replacement of a fresh cotton wool pellet. The patient is also instructed to clean the pulp chamber and change cotton wool pellets after meal times.
- The patient is reviewed at 3–7 days depending on the number of times the patient is able to repeat the 2- hour bleaching sessions. Some patients prefer night use and sleep with the tray in place, which will slow down the process owing to less replenishment of fresh gel. Ideally, daily wear is preferable for controlling the lightening process as between 5–8 applications may be all that is necessary to achieve the desired effect. The longer the tooth has been discoloured, or the more discoloured it is, the longer it will take to bleach back.
- After the desired colour has been achieved, the cavity is dressed with a temporary filling for about 2 weeks to allow the shade to stabilize, and for the oxygen to dissipate from the tooth, allowing the bond strength of the enamel/ composite to improve.

Pre-operative

Post-operative

Side Effects of Home Bleaching

- Gingival irritation—painful gums after a few days of wearing trays.
- Soft tissue irritation—from excessive wearing of the trays or applying too much bleach to the trays.
- Altered taste sensation—metallic taste immediately after removing trays.
- Tooth sensitivity—most common side effect.

Conclusion

NGVB using 10% carbamide peroxide in a custom-fitted tray has proven to be one of the most cost-effective, safe and effective treatments to whiten teeth. The technique initially requires examination, diagnosis and a treatment plan relative to the patient's needs and then continued supervision during the time taken for the patient to bleach his/her teeth. The dentist should be aware of the relevant indications and contra-indications of the technique, as well as other treatment options that may be required as a result of the use of the technique.

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