

# **CLINICAL TOOTH BLEACHING**

The inside/outside bleaching technique

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Reprinted from  
**INDEPENDENT DENTISTRY**  
September 2000

# The inside/outside bleaching technique

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**With bleaching still a controversial and topical issue, Linda Greenwall provides a summary of a simple yet effective technique**

Lightening non-vital teeth can be difficult. The standard technique relies on applying the bleaching agent intracoronal and sealing in the bleaching material into the access cavity, using a temporary restoration. These temporary restorations are often difficult to retain in the access cavity of the tooth as the oxygen which is liberated by the bleaching procedure pushes the temporary restoration out of the tooth. This results in the bleaching procedure becoming ineffective which will not result in a colour change. A new bleaching technique is described for lightening non-vital teeth. The technique is simple and effective. It depends on the existence of an excellent root canal treatment with a hermetic seal and no periapical pathology. The technique will be described in detail in this article.

This technique has also been called internal/external bleaching (Settembrini et al, 1997) and the patient-administered intracoronal bleaching technique or modified walking bleach technique (Liebenberg, 1997). The technique combines the intracoronal

bleaching technique with the home bleaching technique. It is used to lighten non-vital teeth in a simple manner. The access cavity is left open so that the bleaching material (which is normally 10% carbamide peroxide) can be placed into the pulp chamber, while the bleaching tray is applied to the tooth to retain the material on the tooth. Bleaching can thus take place internally and externally at the same time (Figures 1 and 2). At present there are few clinical studies (Carillo et al, 1998) and anecdotal case reports published on this technique. However, the simplicity and effectiveness of this technique war-

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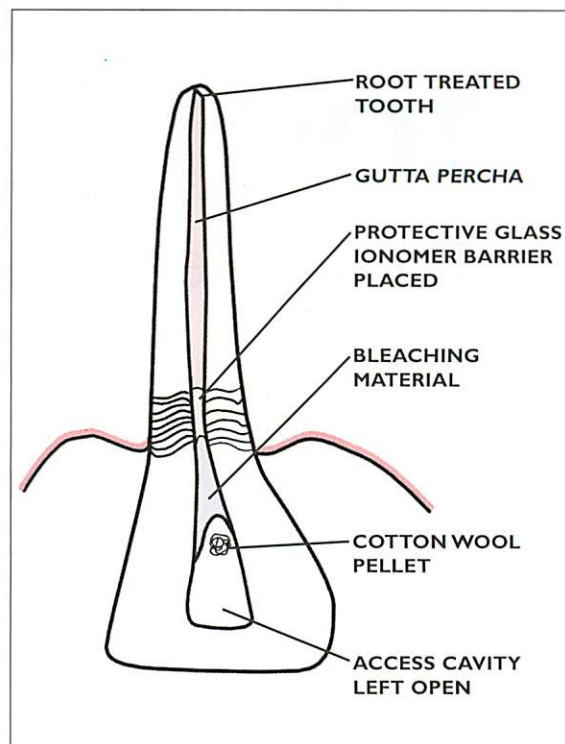
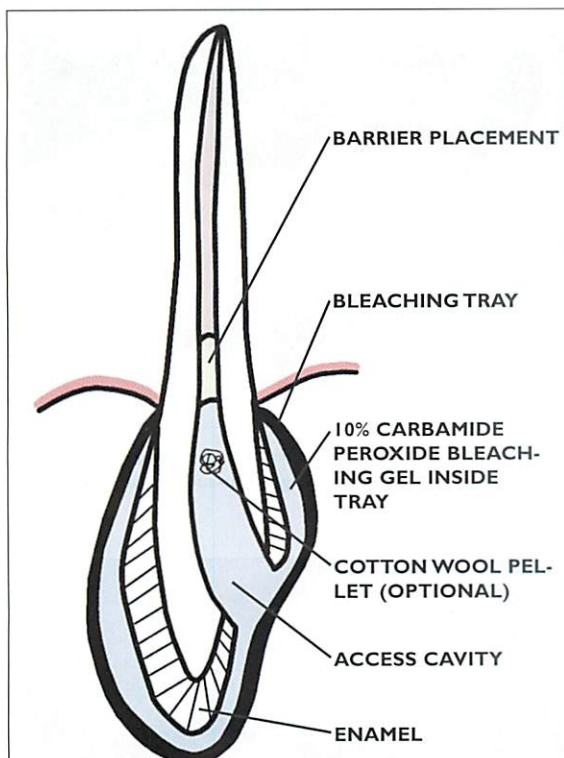


Figure 1: The barrier placement in a non-vital tooth prior to the commencing the inside/outside bleaching technique

rant description and discussion.

## THE PROCEDURE: PREPARATION OF THE BARRIER

The non-vital tooth is prepared in the same manner as intracoronal bleaching. It is essential to have a preoperative X-ray to verify the existence of an excellent root canal treatment. The tooth can be isolated with rubber dam in preparation for the meticulous removal of the existing extracoronal restoration. However, utilisation of the dental dam is not mandatory as the bleaching material is not caustic (Liebenberg, 1997). As in the intracoronal technique, the gutta percha is removed to 2-3mm below the cemento-enamel junction (CEJ). The object of the gutta percha removal is to provide space for the barrier (Figure 1). A protective barrier is placed over the gutta percha to prevent the bleach escaping into the root canal system at the CEJ. Conventional glass ionomer or a resin modified glass ionomer can be used as a barrier (Figure 4b) (Settembrini et al, 1997).



**THE INSIDE/OUTSIDE TECHNIQUE: THE ANTERIOR TOOTH WITH BLEACHING TRAY SEATED OVER AN OPEN INTERNAL ACCESS CAVITY. THE GLASS IONOMER FORMS A BASE AND BARRIER AND SEALS THE GUTTA PERCHA FROM THE ORAL ENVIRONMENT DURING TREATMENT WITH THE CARBAMIDE PEROXIDE BLEACHING MATERIAL**

Figure 2: Showing the proximal view of the tooth in the inside/outside bleaching technique. The bleaching tray can be placed on the tooth to retain the bleaching material. The bleaching material is placed directly into the access cavity and also onto the buccal surface of the tooth

It has been suggested that a calcium hydroxide plug approximately 1mm in thickness is placed over the exposed gutta percha. This prophylactic step aims to maintain an alkaline medium because cervical resorption has been associated with a drop in pH at the cervical level (Liebenberg, 1997). A periapical radiograph can be taken at this stage to check that the barrier has been well placed, but this is not mandatory.

### CLEANING THE ACCESS CAVITY

The access cavity is cleaned and any remaining pulp horn constituents removed. The access cavity can be etched merely to clean the internal surface. It does not enhance the bleaching effect. A cotton wool pellet is placed into the access cavity to avoid food packing (Figure 2).

### SHADE ASSESSMENT

The preoperative shade is taken both of the non-vital tooth colour and the surrounding teeth and noted in

the patient's records or on the bleaching record sheet.

### INSTRUCTIONS FOR HOME BLEACHING

The bleaching tray is checked for fit and comfort (Figure 4e). The patient is instructed not to bite with the anterior tooth during the duration of the treatment (Carillo et al, 1998). The patient is sent home with the bleaching instructions, and enough bleaching materials. The cotton pellet in the access cavity is removed with a toothpick before bleaching. The bleaching syringe can be applied directly into the open chamber (Figure 5a) prior to seating the bleaching tray, or the bleaching material can be applied into the tray with extra material into the space for the tooth with the open chamber (Figure 4d). The patient is instructed to remove the excess with a toothbrush or paper tissue. After the bleaching session, the tooth is irrigated with a water syringe and a fresh cotton wool pellet is inserted back into the tooth. After a meal, the tooth was again irrigated with water to ensure the absence of debris and a fresh cotton wool pellet is inserted.

### TREATMENT TIMING

If the patient can change the solution every two hours, five to eight applications may be all that it is necessary to achieve the desired lightening. This may take a matter of days. The more often the solution is changed, the quicker the bleaching will take place. Nightly application will be slower than twice daily application. It has been advised that unless the tooth is severely discoloured, the bleach should be applied during the day so that the lightening can be better controlled.

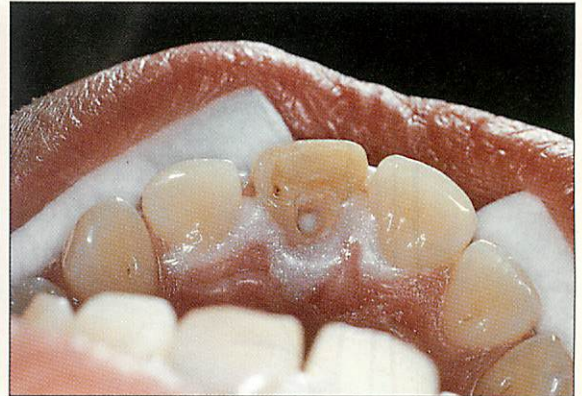
Figure 3: Before commencing bleaching treatment. A radiograph should be taken to check the integrity of the root canal. Even if a tooth appears to be non-vital as in this figure it may not be. This discoloured tooth is still vital. It should not be intentionally devitalised if it gives a positive response to vitality testing. A different bleaching technique can be employed such as at home bleaching or power bleaching to achieve lightening







*Figure 4a: The appearance of the tooth before treatment. This patient had sustained an injury to the tooth at age 12. The tooth had devitalised a year later and required root canal treatment. As the patient was 19 years old, the tooth was unsightly and required further treatment. Bleaching alone would not solve the patient's requirements as the dark tooth was considerably shorter and there had been incomplete gingival maturation around this tooth. It was decided to undertake bleaching treatment first, followed by crown lengthening of the upper left central. This was followed by a porcelain veneer. It could be argued that it would be unnecessary to undertake bleaching treatment first, however bleaching treatment would help achieve a more natural shade of porcelain and a more aesthetic restoration*



*Figure 4b: The access cavity was opened up and the gutta percha removed. A barrier was placed using a light-cured glass ionomer restoration.*



*Figure 4c: The barrier is light-cured*



*Figure 4d: The bleaching material is applied directly into the bleaching tray or into the tooth*



*Figure 4e: The bleaching tray is applied to the teeth*

**REASSESSMENT OF THE SHADE AND BLEACHING RESULTS**

The patient returns in three to seven days. The shade changes are assessed. If sufficient lightening has occurred the bleaching procedure may be terminated. The longer the tooth has been discoloured, the longer it can take for the bleaching treatment to remove the discolouration (Carillo et al, 1998). The darker the tooth, the

longer it will take to lighten.

**SEAL THE ACCESS CAVITY**

The access cavity is then sealed with a temporary dressing. Placement of the final restoration may need to be delayed for two weeks to allow the oxygen to dissipate from the tooth and to allow the bond strength of the enamel/composite to improve (Carillo et al, 1998). If it is





Figure 4f: The result after one week of bleaching. There has been a shade change from A4 to A2



Figure 4g: The access cavity is sealed using a packable glass ionomer material

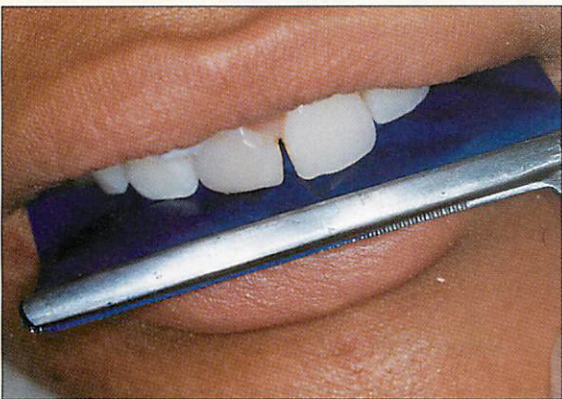


Figure 4h: The occlusion is checked



Figure 4i: The result after home bleaching. The crown lengthening has been undertaken and the gingiva is undergoing healing

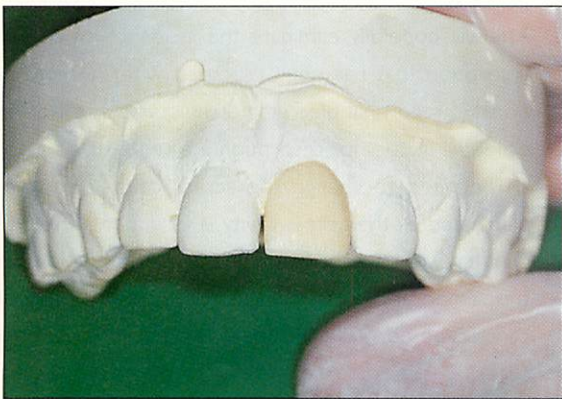


Figure 4j: A diagnostic wax up showing the shape of the final restoration



Figure 4k: The porcelain veneer on the tooth

not possible to wait two weeks to place the final restoration, catalase can be placed into the access cavity by using a sponge pledget for three minutes (Liebenberg, 1997). The catalase is an enzyme, which acts to remove any latent hydrogen peroxide by promoting the reactions involved in the decomposition of hydrogen peroxide into water and oxygen (Rotstein, 1993).

The access cavity is first irrigated with sodium hypochlorite to flush out any remaining debris. The access cavity can then be cleaned using catalase. The cavosurface margin, the enamel surrounding the access cavity and the pulp chamber dentine are etched for 15 seconds with 37% phosphoric acid according to a chosen adhesive protocol. Dentine bonding agents are then applied. Bonding agents containing acetone are pre-



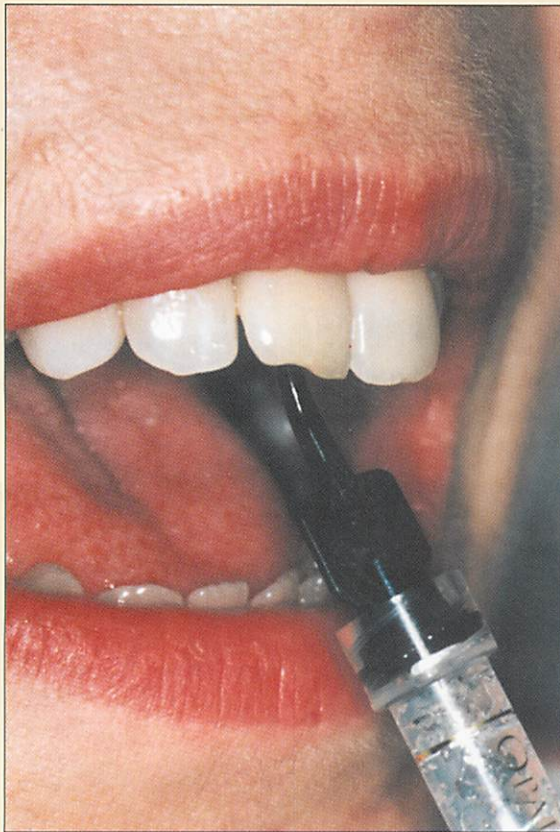


Figure 5a: The bleaching syringe with a fine tip can be applied directly into the access cavity



Figure 5b: The appearance of the teeth before treatment



Figure 5c: The appearance of the teeth two weeks after treatment

ferred in this situation as they have been shown to reverse the effects of bleaching on enamel bond strengths. The access cavity is sealed with a composite restoration using incremental build-ups of composite and a flowable composite at the base, over the glass ionomer. A condensable glass ionomer restoration can be placed immediately (Settembrini et al, 1997) over the barrier (Figure 4g) and a shallower composite restoration placed after two weeks. The thicker base of glass ionomer can sometimes mask the residual discolouration if the non-vital tooth has not fully bleached to match the adjacent teeth.

#### REVIEW

The tooth should be periodically reviewed and a radiograph taken annually to check for any signs of a cervical inflammatory process.

#### Benefits of the inside/outside technique:

- More surface area is available both internally and externally for the bleach to penetrate
- A lower concentration (10% carbamide peroxide with neutral pH) of the bleach is used

- It will hopefully eliminate the incidence of cervical resorption that has been reported with the conventional intracoronal bleaching technique as most of the potential factors for resorption are reduced.
- The need to change the access cavity dressing is eliminated as the access cavity is left open. (The oxygen that was released from the tooth used to blow out the temporary dressing from the tooth. The oxygen can escape normally and there is no build up of pressure)
- Treatment time is reduced to days rather than weeks (Liebenberg, 1997) if repeated replenishment is used
- The patient can discontinue once the desired colour has been achieved
- Using catalase prior to placement of the restoration can eliminate residual oxygen
- No heat is required to activate the bleaching material.

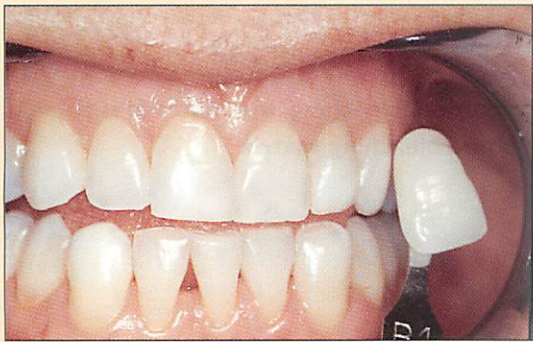
#### RISKS

- The potential for cervical resorption is reduced but still exists
- Non-compliant patients: as the technique is a





**Figure 6a:** The appearance of the teeth before treatment. The upper left lateral tooth was treated with the outsidelinside bleaching treatment. The access cavity was sealed after one week of the outsidelinside treatment. The rest of the teeth were whitened using the home bleaching technique



**Figure 6b:** The appearance of the teeth after treatment

patient-applied technique, it requires the patient to return to have the access cavity filled. Dentists should be careful in their patient selection and patient education to ensure that they return to have the final restoration placed (Carillo et al, 1998)

- Although some degree of manual dexterity is required by the patient to place the syringe into the access cavity, the patient's desire to achieve a whiter tooth counteracts this problem
- The tooth could be over-bleached through over zealous application of the bleaching material by the patient. However as a matrix is used to apply and retain the bleaching material, the colour of the other teeth can be lightened evenly to correct the colour mismatch. It is thus essential to have regular reviews at frequent intervals to assess the colour change taking place
- Shade stabilisation occurs over a two week period (a slight rebound darkening can be expected as with all bleaching procedures one to two weeks later the shade can shift by one shade darker).

## INDICATIONS

- Indications can include treatment for adolescents

with incomplete gingival maturation

- A single dark non-vital tooth where the surrounding teeth are sufficiently light. If this is the case, a window can be cut into the tray at the adjacent teeth to help the patient identify where to place the bleach. An oversized provisional crown form (Wahl, 1992) can be used by there is difficulty retaining the crown (Carillo et al, 1998).

## OTHER OPTIONS FOR NON-VITAL TEETH

Non-vital teeth can be bleached using the bleaching tray at home using 10% carbamide peroxide in a closed chamber technique. This may take longer than a vital tooth because of the nature of the discolouration and the haemosiderin stained dentine. The benefits of this technique are that rather than removing an existing sound restoration, the bleaching material is applied to the tooth via the bleaching tray (Frazier, 1998). This technique may be the treatment of choice when providing a 'top up' treatment or a maintenance bleaching treatment several years after the initial bleaching treatment took place. ■

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**TABLE 1: TREATMENT OPTIONS FOR BLEACHING NON-VITAL TEETH**

**Intracoronaral bleaching: the material is sealed into the access cavity during in office visits and requires frequent changing of dressings**

Intracoronaral bleaching technique:

- Sodium perborate and water sealed into the tooth (Rotstein et al 1991, 1993)

Modified intracoronaral bleaching technique using different products sealed into the tooth such as:

- Various increasing Hydrogen Peroxide concentrations and Sodium Perborate in combination
- Sealing 35% carbamide peroxide into the tooth:
- Sealing 10%, 15% or 20% carbamide peroxide into the tooth (Vachon et al 1998)

Intracoronaral bleaching using the thermocatalytic technique or other forms of heat or heating instruments (not recommended- included for completeness)

**Open chamber bleaching: combining intra and extracoronaral bleaching, the material is applied into the pulp chamber directly and retained with a home bleaching matrix**

Inside/ Outside technique with bleaching tray using:

- 10% carbamide peroxide (Settembrini et al, 1997; Carillo et al, 1998; Caughman et al, 1999)
- 5%, 16%, 22% differing concentrations
- 35% carbamide peroxide - assisted bleaching in tray

**Closed chamber bleaching - extracoronaral: the bleaching material is placed on the external surfaces of the tooth**

Other options:

- Power bleaching using 35% hydrogen peroxide
- Nightguard vital bleaching using 10%, 15% or 20% applied only to the non-vital tooth in the tray (Frazier, 1998)
- Assisted bleaching applied to the external surface on its own or via a bleaching tray

The choice of which bleaching agent to use depends on the nature of the discolouration and the severity of the existing discolouration. Previous reports of cervical resorption following internal bleaching noted more problems when heat was applied to the tooth and when the tooth was previously traumatised prior to revitalisation. To avoid cervical resorption, it may be prudent to avoid high concentrations of hydrogen peroxide and heat.

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Linda Greenwall is author of the textbook *Bleaching Techniques in Restorative Dentistry: an Illustrated Guide* published by Martin Dunitz. It will be out in October 2000. To order a copy, please contact Robert Peden on 0207 482 2202 or e-mail [info@dunitz.co.uk](mailto:info@dunitz.co.uk)