

# An Overview of Bleaching Techniques:

## 2. Night Guard Vital Bleaching and Non-Vital Bleaching

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**Abstract:** 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 discoloured 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 will review various in-surgery and at home techniques used for bleaching non-vital teeth.

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**Clinical Relevance:** Home bleaching is a technique used to improve the shade of discoloured or ageing teeth and provides an easy, non-invasive option compared to veneers and full coverage crowns.

### HOME 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 (thought to be 98% for non-tetracycline stained teeth and 86% for tetracycline stained teeth).<sup>1</sup> Coupled with the fact that patients are able to bleach at their own pace, this technique, with its various

concentrations of bleaching materials and regimens used, has become the gold standard by which other techniques are judged. However, it is by no means without disadvantages, as active patient compliance is required and the technique suffers from high drop out rates.<sup>2</sup> The colour change is dependent on compliant wear and, as some patients do not remember to wear the trays everyday, the results are sometimes less than ideal. On the other hand, excessive use is also possible by some over zealous patients, which frequently causes thermal sensitivity, reported to be as high as 67%.<sup>3</sup> Although thermal sensitivity may be quite high during treatment, persistence of sensitivity after cessation is extremely rare.

### Bleaching Material/Regimen

Nearly all the bleaching materials on the market have been shown to work with little difference between them.<sup>4</sup> Generally, the higher concentration, thicker, more viscous materials produce a lightening effect more quickly than lower concentration, less viscous materials. However, higher concentrations tend to produce more cases of thermal sensitivity.

The choice of material to use depends on a number of factors, including the type of discoloration present and how dark the teeth are initially. However, the most important consideration has to be the patient, his/her lifestyle, the time available for bleaching and whether there are existing problems with tooth sensitivity.

The bleaching regimen is therefore determined by the patient's lifestyle, preference and schedule. If the patient is happy and able to wear trays overnight, then 10% carbamide peroxide worn for 8 hours overnight is the treatment of choice. However, if time is at a premium, this regimen is not recommended, as bleaching time will take about 4 weeks in total as top and bottom teeth are bleached separately. In the author's experience, some patients are able to wear both upper and lower trays simultaneously overnight, thereby cutting down the bleaching period to 2 weeks, but many patients cannot cope with this

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regimen. Higher concentrations of carbamide peroxide, such as 15 or 20%, can be selectively used to treat darker teeth within an arch, such as canines, while still using 10% carbamide peroxide to bleach the lighter teeth within the arch at the same time.

Some patients are unable to wear trays overnight and prefer daily use, which has the advantage of more frequent replenishment of the bleaching gel for maximum bleaching effect, but both occlusal pressure and increased salivary flow may dilute the gel.<sup>5</sup>

### 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! The more realistic answers are a little freshening to the look of the teeth or 1 or 2 shades lighter or words to that effect. These patients can be successfully bleached while alternative treatment should be considered for those with high expectations. Pregnant patients should also be avoided as the



**Figure 1.** Bleaching tray showing both scalloping and buccal reservoirs produced by placement of spacer material on the buccal aspect of teeth on the cast model.

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. Patients need to be aware of all these points and the information again needs to be recorded in the notes. 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



**Figure 2.** Bleaching tray with appropriate amount of bleaching material *in situ*; covering two-thirds of the buccal aspect of the tooth to a thickness of about 1–2 mm.



**Figure 3.** Bleaching tray in patient's mouth prior to removal of excess bleaching material.

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 (Figure 1). There are no differences in the rate of bleaching with or without reservoirs,<sup>6</sup> 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.<sup>7</sup> 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).

Another alternative to the normal plastic trays are those foam-backed trays previously used in fluoride treatment which can be used in a straight border design without the need for reservoirs.

The patient is recalled after the trays are produced and they are tried in the mouth. They should be checked for accuracy of fit and retention, with special attention to the extension of the trays. The patient is then given a demonstration of placement of a small amount of bleaching material. About a 1–2 mm thickness of material is used to fill less than two-thirds of the labial aspect of the tooth space on the bleaching tray (Figure 2). The patient is then shown how to insert the tray in the mouth. A mirror is used to show the patient, with special attention given to removal of the excess material from the gingivae and soft tissues with a cotton wool roll, toothbrush, cotton buds or finger (Figure 3). Patients are allowed to practice the tray placement

and removal of excess material until they are happy with the technique, before asking them to wash their mouths out.

Written instructions should be given to the patient to take home and the protocol usually involves starting with brushing and flossing teeth prior to the application of the bleaching trays. Instructions should also include relevant tray wearing times, possible side-effects and how to deal with them. A bleaching log may be given to the patient to document the frequency of use of the bleaching materials, the length of time the trays are worn for, as well as sensitivity levels experienced.

Patients should be reviewed after 10 days to two weeks. At the review visit the patient is asked if any problems have been encountered and the frequency/times with which the bleaching regimen has been used. It is not unusual for patients to have had a break in treatment as dictated by situations arising socially or as a result of business commitments. The patient's mouth is examined for any adverse effects on the gingivae, mucosa or other soft tissues. Signs of irritation on the gingiva may be indicated by extension of the use of trays, which should be modified accordingly. The shade of the teeth should be reassessed and shown to the patient, along with the start shade prior to bleaching. This tends to please the patient and encourages him/her to continue with treatment if further bleaching is felt necessary. It is

not uncommon for those patients who just want to freshen up the look of their teeth to be satisfied with the shade of their teeth by the first review visit. However, most are encouraged at the review and want to continue to see their teeth lighten further. If only single arch bleaching was undertaken, it is better to complete this arch before embarking on the opposing arch. The contrast between opposing arches encourages the patient to complete the bleaching to the maximum possible whitening effect. Further bleaching material is given to the patient who is asked to return after 2 weeks.

At the second review the same procedure as for the first review is carried out. At this stage, the shade of the teeth is usually 1–2 shades lighter, or even better, depending on the starting shade and type of discoloration. In most cases, the patients are satisfied with the results and a final photograph is taken with both start and end shade tabs *in situ* (Figure 4). If single arch bleaching was used, the patient is instructed to switch to the opposing arch and a similar review protocol is used until the desired effect is reached.

### Home Bleaching Side-Effects

Some patients experience problems with gingival or soft tissue irritation during home bleaching, but the vast majority of problems are those of tooth sensitivity, reported to affect about two-thirds of patients.<sup>6,8</sup> Painful gums may be the result of incorrectly-fitting trays impinging on them or the use of excess material in the trays. The trays can be easily trimmed back and polished while the patient can be instructed to use less material if other areas of mucosa or soft tissues were irritated. Some patients that bleach teeth overnight report a metallic taste sensation immediately following tray removal but this usually disappears after about 2 hours.<sup>9</sup>

Thermal tooth sensitivity is a common side-effect noticed by

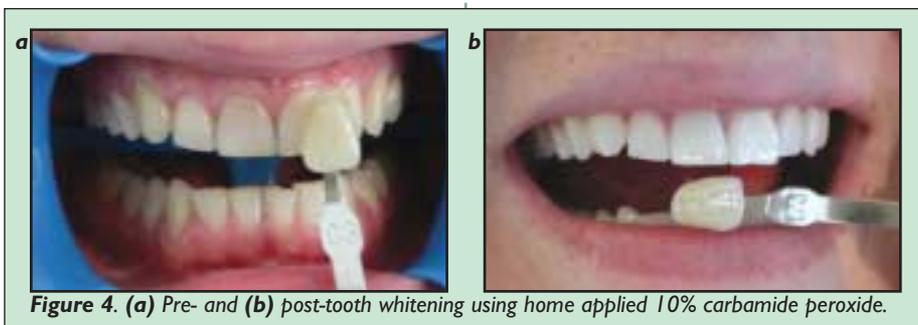


Figure 4. (a) Pre- and (b) post-tooth whitening using home applied 10% carbamide peroxide.

patients as early as the third day of bleaching, following the removal of trays, and may persist for 3–4 hours afterwards. Patients that experience severe sensitivity should be advised to stop bleaching and the sensitivity treated. Treatment can take the form of fluoride-containing toothpastes or neutral sodium fluoride gels in the bleaching trays worn overnight. Desensitizing potassium nitrate or potassium nitrate and fluoride-containing gels are also available for use in trays for about 2 hours before or after the bleaching procedure. Potassium nitrate in toothpastes takes about 3 weeks to reduce sensitivity measurably but, when put in a tray for 10–30 minutes, relief is almost immediate. Lower degrees of sensitivity can be treated with desensitizing toothpaste rubbed or brushed onto the cervical necks of the affected teeth.

Fluoride acts primarily as a blocker of dentinal tubules, which acts to slow down the dentinal fluid flow that causes sensitivity, while potassium nitrate acts like an anaesthetic by preventing the nerve from repolarizing after it has depolarized in the pain cycle.<sup>10</sup>

Other ways of treating sensitivity are passive in terms of not involving specific desensitizing products; they are aimed at reducing the concentration and amount of bleaching gel used or the bleaching time. The trays are trimmed back if necessary and less gel is used in the trays, with the excess being thoroughly removed. The patient may be instructed to apply the bleaching materials on alternate nights or even every third night to reduce the problems of sensitivity. This can delay the treatment time but ensures the patient is comfortable with the bleaching regimen.

### Home Bleaching Tips

Patients that have existing sensitive teeth should have these treated prior

to the start of bleaching. Treatment can be simple; such as the use of desensitizing toothpaste for about 3 weeks prior to treatment, or placing a neutral fluoride gel in the bleaching trays overnight for about 3 weeks prior to treatment. Another option is to graduate wearing times, starting with 1 hour per day for the first week followed by overnight use on the second or third week.<sup>11</sup>

Single dark teeth, such as central incisors or canines, can be treated using 17–20% carbamide peroxide until they reach the same shade as the rest of the teeth, before bleaching the rest of the teeth. The remainder of the procedure can be finished using 10% carbamide peroxide. This can also be combined with 17–20% carbamide peroxide for the darker tooth, if it was felt necessary to use the higher concentration only in the space in the tray for that tooth, this being marked for the patient by cutting a small slot or notch above it. Similarly, combining various concentrations of bleaching agent can be used in patients that have different shades in their mouth owing to varying discoloration aetiologies.

Alternatively, the whole arch may be bleached using 10% carbamide peroxide and the response assessed at the review stage before a decision is taken to treat the teeth that have not responded well to treatment selectively, before continuing with the rest of the bleaching. Those teeth that have not responded well to treatment should be treated similarly to the dark tooth scenario described above. It is very important to explain the selective or combined treatment to the patient and reviews should be regular until the desired result is achieved.

Tetracycline staining can be treated successfully using home bleaching but takes periods of 3 to 6 months to achieve a successful whitening result.<sup>12</sup> The review periods for these patients, after the initial visit at 2 weeks, are monthly, where the same review protocol is practised, except

emphasis is given to motivating the patient to continue with treatment.

### NON-VITAL BLEACHING TECHNIQUES

The oldest bleaching technique, described in 1848, used chloride of lime.<sup>3</sup> There have been many developments since then, all having one thing in common, which is usually a successful result in the procedure returning the discoloured tooth to its original colour, and beyond that when required. There are a number of non-vital bleaching techniques used today. These include:

- ‘walking bleach and modified walking bleach’;
- non-vital power bleaching, also known as ‘thermo/photo bleaching’; and
- ‘inside/outside bleaching’.

### Walking Bleach Technique

First described by Spasser in 1961,<sup>13</sup> the walking bleach technique involved sealing a mixture of sodium perborate with water into the pulp chamber of the affected tooth, the procedure being repeated at intervals until the desired whitening is achieved. The technique was modified using a combination of 30% hydrogen peroxide and sodium perborate sealed into the pulp chamber for one week – the ‘modified or combination walking bleach technique’.<sup>14,15</sup> Sodium perborate is stable when in the form of a dry powder but, in the presence of acid, warm air or water, it decomposes to form metaborate, hydrogen peroxide and nascent oxygen. Hydrogen peroxide mixed with sodium perborate potentiates its effect and produces a better bleaching effect.<sup>16</sup>

Prior to any bleaching procedure, the non-vital tooth must be radiographed to assess the quality of the root canal obturation and the apical tissues. Any deficiencies must be rectified before bleaching.

**Procedure**

- Shade assessment is carried out and a photograph is taken with the shade tab *in situ*.
- The tooth is isolated using rubber dam with caulking putty placed beneath. Ligatures and wedgets (Coltene/Whaledent Ltd, Burgess Hill, W. Sussex, UK ) are used to provide a good cervical seal around the tooth to prevent leakage under the dam.
- The old restoration is removed and the endodontic access cavity is modified to ensure all pulp remnants are removed, including pulp horns to prevent their later breakdown and further discoloration. All the dentine is exposed and any restorative remnants or superficial stain can be usefully removed using air abrasion if available.

To reduce the risk of external root resorption, the GP root filling must be sealed above the level of the crestal bone. Hence, the coronal GP should be removed using a Gates-Glidden bur or a profile orifice shaper (Dentsply Limited, Weybridge, Surrey, UK) to below the level of the cemento-enamel junction by about 2–3 mm measured using a periodontal probe.

- A glass ionomer base is now used to seal the coronal end of the root canal completely so that a barrier is formed between the root canal system and the floor of the pulp chamber.
- The bleaching paste is prepared using sodium perborate with water/saline or even local anaesthetic solution to a semi-thick consistency. The pulp chamber is packed with the paste and excess liquid is removed by tamping with a cotton wool pellet.
- Excess paste is removed and a temporary restoration (zinc oxide eugenol or glass ionomer) is packed on top of the paste to ensure a good seal.
- The rubber dam isolation is removed and the patient is recalled in 2 weeks. The treatment is

repeated until the desired effect is reached.

The ‘combination bleach technique’ differs from above only in that sodium perborate is mixed with 30% hydrogen peroxide (or lower concentrations) instead of water to form the thick paste which is sealed into the cavity. The procedure is quicker acting, hence review is after one week.

**Internal Non-Vital Power Bleaching**

The procedure is identical, in terms of isolation and preparation of the tooth, as that described above, except that the bleaching agent and its application/activation are different.

Hydrogen peroxide gel (30–35%) is placed in the pulp chamber and activated either by light or heat. The temperature is usually between 50 and 60 °C maintained for 5 minutes before the tooth is allowed to cool down for a further 5 minutes. The gel is removed by washing with water for a further minute.<sup>16</sup> The tooth is dried and the ‘walking bleach technique’ is used between visits until the tooth is reviewed 2 weeks later to assess if further treatment is necessary.

A variation on this technique uses 35% hydrogen peroxide gel applied both internally to the pulp chamber and externally to the labial surface of the tooth, with light activation internally and externally (Figure 5). High temperatures are not involved

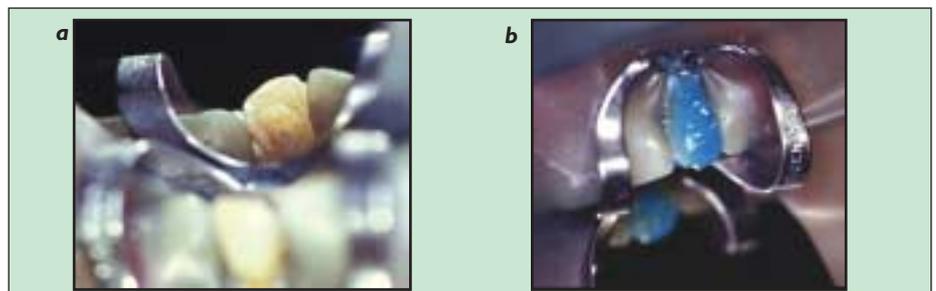
and the same preparation protection techniques are used on the tooth. Light activation both internally and externally can be in the form of a conventional halogen curing light, plasma arc lamp or a diode laser utilizing the same three 5-minute pass protocol described for external power bleaching techniques. Following this procedure, the tooth is washed and dried before being sealed with a temporary restoration. The patient is reviewed 2 weeks later when the shade would have stabilized and the tooth is ready for a definitive restoration to be placed, or is further bleached if required.

**Inside/Outside Bleaching**

This technique is a combination of internal bleaching of non-vital teeth with the home bleaching technique. The preparation of the non-vital tooth is exactly the same as that described above for the ‘walking bleach’ in that a protective barrier is placed over the root canal system using glass ionomer and the access cavity is completely cleaned ready for the bleaching procedure. Rubber dam isolation is not essential as no caustic materials are used with this technique.

**Procedure**

- The patient is instructed on placement of a cotton wool pellet into the cavity when not undergoing the bleaching



**Figure 5.** Internal non-vital bleaching using a modified power bleaching technique after (a) preparation of the access cavity and protection of the root canal system using glass ionomer cement; (b) 35% hydrogen peroxide gel is placed inside and outside of the tooth and light activated.

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.<sup>17</sup> The longer the tooth has been discoloured, or the more discoloured it is, the longer it will take to bleach back.<sup>17</sup>
- 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.<sup>17</sup>

The advantage of this technique for bleaching non-vital teeth is that it

utilizes both an internal and an external approach for the bleaching agent. Use of lower concentrations of bleach, usually 10% carbamide peroxide, are thought to reduce the risk of external resorption. There is no need for frequent changes in temporary dressings, as was experienced with the walking bleach when the oxygen build up within the pulp chamber would dislodge the dressing. Additionally, the technique achieves the lightening effects within a matter of days compared to weeks.

The main disadvantages of this technique are the need for patient compliance and the need for enough manual dexterity to place the bleaching agent into the cavity. Also, not only can over use lead to over bleaching, but the potential for external resorption still exists despite being reduced, so this technique is by no means without its risks.

As with the modified bleaching technique, the inside/outside bleaching technique has been modified by the use of varying concentrations of carbamide peroxide ranging from 5%, 16%, 22% or even 35%, as used in the waiting room technique.

### 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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### DECEMBER CPD Answers

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|------------|-------------|
| 1. A, B, D | 6. B, C     |
| 2. B, C, D | 7. B, C     |
| 3. A, C, D | 8. A, C     |
| 4. B, C, D | 9. A, B, D  |
| 5. A, C    | 10. B, C, D |