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TECHNIQUES

In-office tooth whitening

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Abstract Peroxides have been used to whiten teeth for over 100 years and among all whitening therapies the oldest is in-office bleaching. In this article, we will present the summary of the step-by-step procedure and side effects of this bleaching. Some comments regarding the number of clinical appointments for teeth whitening, concentration of the bleaching products, the effects of dentin dehydration and demineralization on the final outcome as well as bleaching-induced tooth sensitivity are given. At the end, some references for further reading can be found.

Keywords In-office bleaching · Step-by-step procedure · Side effects · Tooth sensitivity

Quick reference/description

Tooth whitening is a dental procedure that involves use of bleaching agents for obtaining a lighter tooth shade. Different whitening methods include:

- In-office bleaching, done by a dental professional.

The name of the second author was originally rendered incorrectly. The article has now been corrected accordingly.

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- At-home bleaching, done by the patient at home, include materials prescribed by dental professionals and materials available over-the-counter to be applied without the involvement of a dental professional.
- The combination of in-office and at-home bleaching ("combined bleaching technique").

In-office tooth whitening is a treatment option usually considered for the patients who do not adapt well to the at-home protocol.

Indications

In-office tooth whitening is indicated in following cases:

- In patients who have difficulty in wearing tray delivery products.
- To motivate patients before starting an at-home protocol in the combined or jump-start technique.

Materials/instruments

Hydrogen peroxide (HP)
Rubber dam
Light-cured gingival barrier
Lip and cheek retractors
Shade guide
Desensitizing gel
Rotating brush
Gauze
Saliva Ejector
Quartz–tungsten halogen light curing units
LED (Light-emitting diode)
Lasers

Procedure

In-office bleaching protocols can vary significantly, like the application time of the bleaching gel, the number of bleaching sessions, whether or not the protocol is associated with light and the number of product refreshment on the dental surface.

Following are the steps involved in an effective in-office bleaching protocol:

Advantages and disadvantages

Below, a table is given (Table 1) that describes advantages and disadvantages of in-office and at-home bleaching treatment.

Table 1 Advantages and disadvantages of at-home bleaching vs in-office bleaching

Advantages in-home	Disadvantages at-home
Very effective, durable whitening, mainly when 10% carbamide peroxide is used	Relatively long treatment time and need patient compliance
Safe	Tooth sensitivity (mild and low frequent when compared to in-office)
Low cost compared to in-office procedures	Few patients can feel irritation in the tongue and lips, as well as, gingival inflammation, mainly because tray design and bleaching concentration
Advantages in-office	**Disadvantages in-office**
Ideal to patients who do not adapt well to the at-home bleaching technique	More expensive
It is the patients' first preference because it provide fast results (one session)	More frequently and higher intensity tooth sensitivity
Does not need patient compliance	Gingival burn when correct protection for gingival tissue is not done
Useful to motivate patients to start bleaching treatment (jump-start technique)	Usually, no durable results are achieved when compared to at-home. The exception is when 35% hydrogen peroxide alkaline gels, containing desensitizing agents are used

Making a decision about the in-office bleaching gel

Different in-office bleaching products vary in the active concentration of HP, which ranges from 15 to 40%. Use of 35% alkaline gels, containing desensitizing agents, is recommended.

The pH of in-office bleaching gels may vary from 2.0 to 9.0. Whitening products should also be relatively alkaline pH to minimize potential damage.

Determination of the baseline tooth color

Determination of the baseline tooth color allows the dentist and also the patient to monitor color change during the bleaching protocol. It can also help in observing the whitening degree obtained after dental bleaching.

Shade recording can be done with a value-oriented or bleach shade guide (Fig. 1), spectrophotometer, or by means of dental photographs.

Application of a desensitizing agent

Tooth sensitivity is one of the main side effects of in-office dental bleaching.

Fig. 1 The baseline tooth color being recorded with a value-oriented shade guide after performing a dental prophylaxis

It is difficult to completely eliminate this side effect, but its absolute risk and intensity can be reduced by previous application of a desensitizing gel composed of 5% potassium nitrate.

Desensitizers containing glutaraldehyde and HEMA (2-hydroxyethyl methacrylate) are also effective in reducing bleaching-induced tooth sensitivity.

This procedure can be performed before or after isolation of the dental arch, as the materials are not aggressive to the gingival tissue. As the gel is usually agitated with the aid of a rotating brush, it is recommended to apply the desensitizer before the protection of the soft tissues.

The buccal surface of all the teeth to be bleached is covered with a 1 mm (mm) thick layer of the desensitizer and left in place for 10 min (min) (Fig. 2). After this, the product is agitated in each dental surface for 20 s (s) with a rotating brush.

The product is then removed with gauze (Fig. 3) or with a saliva ejector before application of the in-office bleaching gel. Finally, the surface is rinsed to remove the product completely.

Protection of the soft tissues

Higher concentrations of hydrogen peroxide used for in-office bleaching may cause burning of the soft tissues.

For protection of the soft tissue, lip and cheek retractor (keeps lips, cheeks, and tongue away from the bleaching gel) along with light-cured gingival barrier

Fig. 2 Application of a desensitizing gel composed of 5% potassium nitrate for 10 min (Dessensibilize KF 2%, FGM, Joinville, SC, Brazil). After this period, the product should be agitated in each dental surface for 20 s with a rotating brush before removal

Fig. 3 Removal of the desensitizing gel with dental gauze or high-speed suction. After removal of the excess, water rinsing is performed

Fig. 4 A lip and cheek retractor (ArcFlex, FGM, Joinville, SC, Brazil) is applied, followed by the application of a light-cured gingival barrier to protect the marginal gingival tissue

(prevents the contact of the bleaching gel with the gingival tissue) is commonly used (Fig. 4).

Rubber dam isolation can also be used for protection of the soft tissues.

Before rubber dam installation, a thick layer of petroleum jelly should be applied on the gingival tissue of the teeth to be bleached. Due to its hydrophobic nature, it prevents the bleaching gel from contacting the gingival tissue even if eventual isolation failure occurs.

Application of the in-office bleaching gel

After choosing the in-office bleaching product, the manufacturer's instructions should be followed.

Most in-office bleaching gels require replenishing the product during a period that varies from 40 to 50 min. Some products require more product replenishments in each clinical session. Few products are indicated for a single 40–50-min application without replenishment.

As heat and light can accelerate the dissociation of hydrogen peroxide, both methods have been associated with in-office bleaching. In-office bleaching gels can be categorized on the basis of their activation as:

Chemically activated bleaching gels

The in-office gels are more stable in acid solutions than in alkaline solutions. Commercially available bleaching gels are packed in two syringes/bottles, one containing the HP product and other containing the colorants, thickening agent, etc.

When clinician mixes both syringes/bottles, chemical activation occurs due to mixing of two components. This increases HP decomposition and the in-office gel can be used (Fig. 5).

The activating gel increases the pH of the mixed gel to achieve an alkaline pH close to the pKa of the hydrogen peroxide (pka = 11.0), thereby increasing the decomposition rate of peroxide and the formation of oxidative radicals.

Light activated bleaching gels

Some manufacturers advocate the application of their products with light activation (quartz–tungsten halogen light curing units, LEDs or lasers) to optimize the bleaching outcome. This is only recommended with low concentration of HP (15–20%).

Another option is addition of some metals (ferrous compounds or titanium dioxide) to enhance the oxidizing power of the HP. The photolysis of HP associated with these compounds needs to be activated by a very specific wavelength, which depends on the metals included.

Products that contain ferrous components are activated by ultraviolet light.

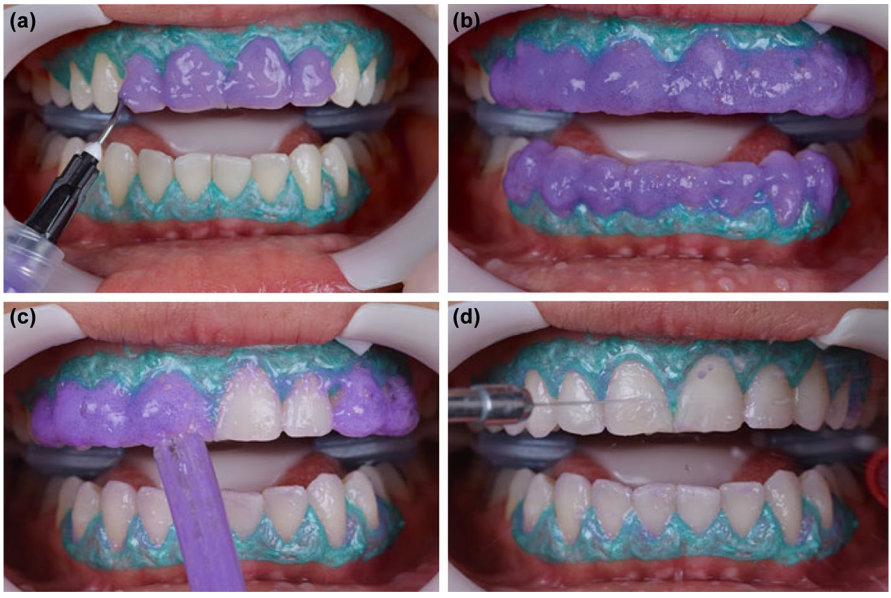

Fig. 5 **a** 35% hydrogen peroxide in-office bleaching gel (Whiteness HP Blue 35%, FGM, Joinville, SC, Brazil) is mixed and applied in all teeth to be bleached. **b** After some time in place, bubbles are visible in the gel, which result from the decomposition of the hydrogen peroxide. **c** A suction tip is first used to remove the gel prior to, **d** water rinsing of the tooth surfaces

Fig. 6 Chemical burning of the cervical gingiva of several teeth after an in-office bleaching application with a high-concentration hydrogen peroxide

Fig. 7 **a** Patient's smile before rubber dam isolation. **b** The rubber dam is placed in the upper dental arch and left undisturbed for 10 min. **c** The effect of dehydration is observed immediately after rubber dam removal (Images provided by Camilo Andrés Pulido Mora, DDS, MS)

HP when combined with iron is known as "Fenton reagent". Fenton reagents result in disproportion in which the iron is simultaneously reduced and oxidized to form both hydroxyl and peroxide radicals by the same HP.

When iron reacts (with or without UV radiation), the process is renewed and the redox reaction is further fueled.

When low-concentrated HP gels (6–15%) containing semiconductors of titanium oxide nanoparticles doped with nitrogen is exposed to blue light (LED/laser device), catalysis of reaction of hydroxyl radicals formation from HP occurs.

As these titanium oxide bleaching formulations can be used with visible lights, they are safer than the formulations that recommend UV light activation.

Pitfalls and complications

- Bleaching-induced tooth sensitivity is a common side effect. Although pain in bleached teeth can be evoked by cold or other stimuli, most patients complain of tingling or shooting pain of very short duration but variable frequency without provoking stimuli.
- Gingival tissue irritation can occur due to the bleaching agents (Fig. 6). A drop of catalase and/or sodium bicarbonate (usually provided by the manufacturer) should be applied on the ulcerated lesion to arrest the burning effect.
- Dental dehydration is always associated with the procedure (Fig. 7).
- Enamel demineralization.
- Ultraviolet radiations can cause skin damage.

Further reading

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