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Enhancing Combination In-Office and Take-Home Tooth Whitening

A Case Report



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Today, conservative smile enhancements are routine procedures in many dental practices, and the most common and least invasive method for quickly changing someone's smile is in-office tooth whitening. Whether for a "pick-me-up" or because the dentition is noticeably and severely stained, vital tooth bleaching is a viable and realistic option for many patients as a means to improve their smiles and their overall appearance. To further ensure the long-term effects of the in-office procedure, at-home, tray-based bleaching has been advocated as a follow-up.

Tooth discoloration can manifest itself as a result of aging, disease, or exposure to a variety of agents, including medications, foods, and beverages.¹⁻³ Intrinsic stains result from defects during tooth development, fluorosis, or the use of tetracycline.³ Extrinsic stains, on the other hand, are localized in the pellicle and are generated by the reaction between sugars and amino acids or are

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acquired from the retention of exogenous chromophores in the pellicle.³

The success of whitening regimens of varying durations using peroxide agents has been well documented in the literature for treating both extrinsic and intrinsic stains.¹⁻⁴ However, to reduce intrinsic stain and change the inherent tooth color, professional tooth-whitening products that rely on proven technologies (such as 35% hydrogen peroxide for in-office power bleaching or 10% to 15% carbamide peroxide for at-home bleaching) have traditionally been used.³ Over-the-counter products that whiten through the actions of surfactants, abrasives, anticalculus agents, and low levels of hydrogen peroxide have been used to whiten extrinsically stained teeth and/or help maintain bleaching effects after



Figure 1. Preoperative retracted view of the patient's teeth demonstrating yellow discoloration.



Figure 2. The extent of the patient's discoloration was evaluated against shade tabs provided with the in-office whitening system.



Figure 3. Based on the Vita classic shade tabs, the patient's preoperative tooth shade was A3.



Figure 4. The preoperative shade of A3 was confirmed with the use of a digital spectrophotometer.

professional treatment.³

A brief review of the literature shows that, in general, the oldest and most accepted form of vital tooth bleaching—nightguard vital bleaching—has been proven safe and effective, with long-term shade retention when a 10% carbamide peroxide solution is used.⁵ When in-office bleaching products have been studied—specifically a 35% hydrogen peroxide-based gel—it has been shown that this light-activated bleaching method demonstrates bleaching into dentin of uniform depth.⁶

However, tooth sensitivity and gingival irritation are commonly noted side effects of in-office and take-home bleaching treatments, as well as some over-the-counter products.^{5,7} Therefore, as researchers and manufacturers have sought ways to provide clinicians with products that would produce faster whitening results for patients and provide a more comfortable treatment experience, a variety of approaches for enhancing the vital tooth bleaching process have emerged. For example, it was proposed that tooth whitening could

involve the use of activating agents to enhance the performance of hydrogen peroxide and natural enzymes.³ Research has subsequently produced data that demonstrate positive effects from chemical catalysts added to bleaching gels.⁸

In published literature investigating the effects of light activation of whitening agents, researchers have noted that the addition of light can increase the tooth-whitening effect of peroxide, even in concentrations as low as 15%.⁹ In fact, it was noted that peroxide and light treatment significantly lightened the color of teeth to a greater extent than did peroxide or light alone, with a low and transient incidence of tooth sensitivity.⁹ Other investigations have also found that color changes are significantly affected by an interaction of bleach and light variables.¹⁰

Insofar as tooth sensitivity and gingival irritation during the bleaching process are concerned, studies have suggested various approaches for desensitization. One study suggests that the use of an active potassium nitrate and fluoride desensitizing agent may



Figure 5. Prior to in-office bleaching, prophylaxis was completed using the GC TION Prophy Paste.



Figure 6. A cheek and lip retractor was placed, and cotton rolls and a facial mask were also placed to prevent contact of the whitening gel with the patient's skin.



Figure 7. A gingival protector was placed and cured.



Figure 8. A thin coat of bleaching reactor was applied with a disposable tip brush to the surface of each tooth to be whitened.



Figure 9. The GC TION Whitening Gel was syringed onto each tooth to be bleached.



Figure 10. The whitening gel was activated with a curing light for 1 minute per tooth.

decrease tooth sensitivity when compared with a placebo in a population at risk for tooth sensitivity.¹¹ Pertaining to shade stability, research has shown that the addition of amorphous calcium phosphate to a professional 16% peroxide bleaching gel regimen produces 10% better long-term whitening efficacy (ie, shade retention) than the traditional bleaching gel tested, with tooth sensitivity, soft-

tissue health, and gingival health remaining similar to baseline levels.¹² It would appear that the most efficacious and comfortable tooth-whitening approach would be one that

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continued on page 134

Enhancing Combination...

continued from page 133



Figure 11. The immediate visible results of the bleaching sequence demonstrate a significant whitening effect.



Figure 12. A sensitivity-reducing, calcium- and phosphate-containing paste was applied post-bleaching to the teeth.



Figure 13. Immediate post-bleaching results indicate that the patient's tooth shade has lightened to an A1 from an A3.



Figure 14. The fit of the custom take-home bleaching tray is verified in-office.



Figure 15. Two weeks following completion of the take-home regimen, the patient's definitive shade is a B1 from an original A3.



Figure 16. View of the patient demonstrating his successfully whitened smile.

shade retention.⁸⁻¹² Additionally, because tooth sensitivity is most often seen as a result of tooth dehydration,¹³ which has been associated with an improper oral pH balance, the whitening system used would, therefore, need to include a formulation with a pH that would not produce deleterious effects on enamel or dentin.¹⁴

A NEW IN-OFFICE AND TAKE-HOME WHITENING APPROACH

In response to these needs, a new, combination in-office and take-home whitening system has been introduced. The GC TiON Tooth Whitening System (GC America) features a titanium dioxide photocatalyst that enables dental professionals to offer patients enhanced whitening in-office in a shorter period of time, and with a lower concentration of hydrogen peroxide (20%). This lower hydrogen peroxide concentration contributes to less patient sensitivity, while the photocatalyst produces highly effective whitening when activated with any commercially available bleaching light or dental curing light.

Because both the in-office formulation and the take-home kit are pH balanced, they are less likely to demineralize the teeth, so there is even less risk of patient sensitivity. To minimize further any likelihood of sensitivity, as well as to ensure shade stability of the whitening results, both the in-office system and the take-home kit feature an after-whitening paste containing bio-available calcium and phosphate, and the take-home whitening formulation itself contains potassium nitrate and fluoride.

CASE PRESENTATION

A 31-year-old male patient presented with a chief complaint of teeth that were "too yellow" (Figure 1). Following a thorough examination that included radiographs and intraoral digital photographs, it was determined that no pathologies were present that would contraindicate vital tooth bleaching, whether in-office, take-home, or the use of at-home over-the-counter products. The patient was

then educated and informed about the variety of tooth-bleaching alternatives available, including light-activated in-office bleaching, home-bleaching with a customized tray, and over-the-counter products. The patient elected to whiten his teeth through the in-office and take-home GC TiON Tooth Whitening System.

To best assess the patient's preoperative shade, 3 assessment tools were used. The patient's teeth were first evaluated against the bleaching system shade guide (Figure 2), as well as using the Vita classic shade tabs (Figure 3). Through these methods, the patient's preoperative tooth shade was determined to be A3. This was confirmed through the use of a digital spectrophotometer (EasyShade [Vident]; Figure 4).

Preparation for In-Office Bleaching

Impressions were taken of the patient's upper and lower arches for use in fabricating models and the custom-fitted, vacuum-formed take-home bleaching trays.

Prior to initiating the in-office whitening procedure, the tooth surfaces were cleansed using a non-fluoride prophylaxis paste (GC TiON Prophylaxis Paste [GC America]; Figure 5). While performing the prophylaxis, care was taken not to exceed 5,000 rpm.

A cheek and lip retractor was placed, and cotton rolls and a facial mask were also placed to prevent contact of the whitening gel with the patient's skin (Figure 6). A generous amount of lip balm protectant was applied to prevent the patient's lips from drying out during the bleaching procedure. The patient was also provided with suitable eye protection to wear during the bleaching treatment.

The teeth to be whitened were then dried with air, and a gingival protector (GC TiON Gingival Protector) was placed (Figure 7). This was applied in a 1-mm to 2-mm thickness covering 4 mm to 5 mm apically from the gingival margin. Approximately 0.5 mm of protector was placed on the tooth surface adjacent to the gingival margin. After

application, the gingival protector was cured for 10 to 20 seconds using a 400-nm to 500-nm curing light.

Application of In-Office Bleaching Agents

Using a disposable tip brush, one thin layer of reactor was applied to the surface of each tooth to be whitened (Figure 8). This was blown dry with an air syringe to remove excess. The whitening liquid and whitening gel were thoroughly mixed into the whitening gel syringe, ultimately reaching the desired viscosity. This could be easily placed on the tooth surfaces without slumping or running, thereby minimizing the risk of accidentally contacting soft tissues. The whitening gel was syringed onto each tooth to be whitened in a thickness of between 0.5 mm and 1.0 mm (Figure 9). An LED curing light (Ultra-Lume LED 5, Ultradent Products) was used to activate the whitening gel for 1 minute per tooth (Figure 10).

The gel was removed from each tooth using gauze, working from the cervical to the edge. However, given the severity of the patient's yellow discoloration, the bleaching protocol was repeated twice more, from the placement of the whitening gel, curing, and removal. The immediate visible results of the bleaching sequence demonstrated a significant whitening effect (Figure 11).

Tooth Treatment After In-Office Whitening

Once the whitening gel was definitively removed from each tooth, a paste containing bio-available calcium and phosphate (PROSPEC MI Paste, GC America) was applied to the teeth with a prophylaxis cup and allowed to remain in place for 3 to 5 minutes (Figure 12). Application of this paste helped to relieve sensitivity, minimize shade relapse, and buffer against plaque acid. It was then rinsed off. At that time, the immediate post-bleaching results were confirmed with a Vita shade tab, and the patient's teeth had successfully lightened from an A3 to an A1 (Figure 13).

Because both the in-office formulation and the take-home kit are pH balanced, they are less likely to demineralize the teeth, so there is even less risk of patient sensitivity.

Take-Home Whitening Protocol

The patient was thoroughly instructed on the use of the take-home hydrogen peroxide whitening system (GC TiON Take Home), and the fit of the custom-made take-home bleaching tray was verified in office (Figure 14). Similar to the in-office system, the whitening agents in this take-home kit demonstrate a balanced pH (6.4 according to the manufacturer), so there would be less likelihood of tooth demineralization or sensitivity. Additionally, the take-home gel contains desensitizing potassium nitrate and sodium fluoride.

The patient was instructed to complete the take-home whitening regimen for 5 days, wearing the tray with an application of bleaching gel for anywhere from 2 to 10 hours per day. Each whitening application was to be followed by the use of the desensitizing paste (PROSPEC MI Paste) to help relieve sensitivity and minimize a shade relapse.

The patient's teeth were examined 2 weeks following the completion of the take-home regimen in order to most accurately determine the definitive shade change. At that time, using the Vita classic shade tabs, it was determined that his teeth had successfully been bleached from an original shade of A3 to a shade of B1 (Figures 15 and 16).

CONCLUSION

Conservative smile enhancements such as the case described can now be completed more efficaciously and com-

fortably. The introduction of a new combination in-office and take-home whitening system that features a titanium dioxide photocatalyst enables dental professionals to offer patients enhanced whitening in a shorter period of time, with a lower concentration of hydrogen peroxide, (20%) and, therefore, less sensitivity. In particular, this case has demonstrated how the whitening system accomplishes the objectives of accelerating and activating the whitening action of hydrogen peroxide, limiting and reducing the likelihood of tooth sensitivity, and promoting greater shade retention. Although further evaluations are necessary to determine the long-term safety and efficacy of this system, its initial results, in this author's opinion, are positive. ♦

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