

# Treating Sensitivity During Tooth Whitening

**Abstract:** *The most common side effect of tooth whitening is tooth sensitivity. There are a number of materials and techniques for reducing sensitivity. This article focuses on potassium nitrate applied either by brushing before initiating whitening or by application via a tray during whitening to reduce sensitivity. A detailed step-by-step procedure for managing hypersensitive patients is described.*



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There are 3 major methods for tooth whitening: in-office or power whitening with 25% to 35% hydrogen peroxide; at-home or tray whitening with 10% carbamide peroxide (some newer systems use 6% to 10% hydrogen peroxide); and over-the-counter (OTC) strips, wraps, or paint-on products with 6% to 10% hydrogen peroxide. The most frequent side effect with any type of tooth whitening is sensitivity,<sup>1</sup> but gingival irritation also has been noted.<sup>2</sup> The purpose of this article is to focus on treatments for tooth sensitivity during whitening of all forms, and specifically the available options for tray whitening.

## Whitening Options

The oldest form of whitening, the in-office procedure using 35% hydrogen peroxide, has a long history of tooth sensitivity and gingival irritation, affecting 10% to 90% of patients according to recent figures.<sup>3-5</sup> Some sensitivity has been severe enough to require strong medications, and some dentists premedicate their patients with nonsteroidal anti-inflammatory drugs to minimize sensitivity.<sup>6</sup> Because in-office whitening often takes more than 1 appointment to achieve the maximum lightening,<sup>7</sup> appointments generally are scheduled at least 1 week apart to allow the discomfort to dissipate.<sup>8</sup>

Newer OTC products, such as strips and wraps, also cause sensitivity, although the gingival irritation often is greater than the tooth sensitivity.<sup>9-12</sup> As with any treatment, the higher the concentration of peroxide, the greater the incidence and severity of tooth sensitivity as well as the potential for gingival irritation.<sup>13</sup> Even shorter wear times of strips with higher concentrations have demonstrated greater sensitivity than strips with lower concentrations worn longer.<sup>12</sup>

Tray whitening with 10% carbamide peroxide is the most popular form of whitening today (Figure 1), but it also causes tooth sensitivity as the main side effect.<sup>14</sup> Earlier studies tried to determine if there were predictors for sensitivity; however, only inherent patient sensitivity (a history of sensitive teeth) and more than 1 application per day had any correlation.<sup>15</sup> All other factors, such as age, gender, exposed dentin or cementum, cracks, pulp size, allergies, decay, etc, were not predictable indicators for sensitivity.<sup>15</sup> Contributing factors include the use of rigid trays, the amount of soft tissue contact, the vehicle carrying the peroxide, the viscosity of the material, different flavors, and patient habits.<sup>15</sup> A review of all of the clinical trials on whitening indicates that 25% to 75% of the treatment groups (receiving the active ingredient of peroxide) experienced sensitivity. Interestingly enough, 20% to 30% of the placebo groups (not receiving peroxide) experienced sensitivity.<sup>16</sup> Just wearing a tray alone can produce about 20% sensitivity.<sup>13</sup>

Hence, the dental office must be prepared for the possibility of sensitivity during whitening treatment, regardless of claims made by the manufacturer, because tooth sensitivity is the main deterrent to a patient successfully completing their whitening treatment. Depending on the severity of the tooth sensitivity, some clinicians recommend discontinuing whitening treatment.

### Whitening Ingredients

There are 2 main ingredients used in whitening: hydrogen peroxide and carbamide peroxide. Carbamide peroxide breaks down into hydrogen peroxide and urea. A 10% solution of carbamide peroxide is roughly 3.5% hydrogen peroxide and 6.5% urea.<sup>17-21</sup> The hydrogen peroxide further reduces to water and oxygen, and the urea to ammonia and carbon dioxide. While both carbamide and hydrogen peroxide are used for whitening, their properties are quite different. Hydrogen peroxide is very unstable and releases all of its peroxide in 30 to 60 minutes (Figure 2).<sup>22-26</sup> It applies a rapid rush of peroxide to the pulp and is cited as causing more sensitivity than carbamide peroxide at the equivalent dose. Carbamide peroxide releases about 50% of its peroxide in the first 2 to 4 hours, then the remainder over the next 2 to 6 hours.<sup>17,19</sup> Hence, it is more of a time-release approach, which causes less sensitivity. For the most effective whitening per dose, carbamide peroxide products work better overnight while hydrogen peroxide, because it becomes inactive so quickly, works better when used during the day for 30 to 60 minutes. Higher concentrations of either peroxide cause a greater insult to the pulp and more sensitivity. Patients who are interested in the fastest whitening possible often request higher con-

centrations of carbamide peroxide than the original 10% formulation. While this possibly will shorten the treatment time by a few days, it is not a linear relationship (ie, 20% is not twice as fast as 10%<sup>18</sup>). The main disadvantage to using higher concentrations is that there is an increased level of sensitivity, which must be addressed.<sup>22,27</sup> In-office whitening with the highest concentration of peroxide applied for 1 hour generally exhibits the greatest sensitivity.

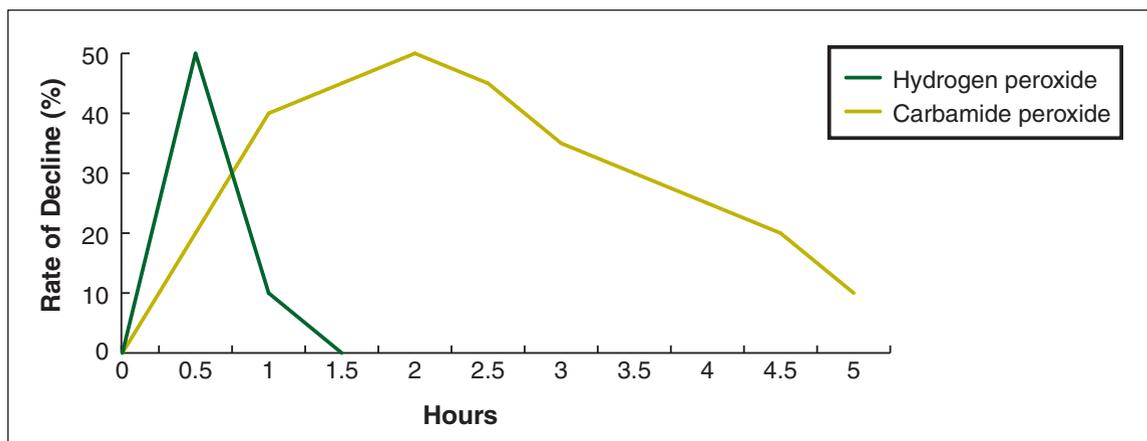
### Sensitivity Occurrence

Tooth sensitivity with whitening usually affects the smaller teeth, such as the maxillary laterals and the mandibular incisors. This sensitivity does not necessarily occur during treatment but can occur as long as 8 hours after treatment. It can be a generalized tooth sensitivity, but it is often described as a sharp shooting pain or “zinger” to 1 or 2 teeth. The etiology of this sensitivity results from the easy passage of the peroxide through the enamel and the dentin to the pulp, which takes 5 to 15 minutes (Figure 3).<sup>28</sup> Further proof of this passage of peroxide is the research that has shown that the dentin changes color next to the pulp as fast as it does next to the dentin-enamel junction.<sup>29</sup> Hence, sensitivity results from the insult of the peroxide on the nerve and may be considered a reversible pulpitis. The major factor for the degree of tooth sensitivity is the patient’s inherent sensitivity and pain threshold levels, but that is also magnified by higher concentrations of peroxide and pressure on the teeth from trays or occlusion.

Generally, sensitivity occurs in the first 2 weeks of treatment, often in the first few days.<sup>30</sup> Sensitivity decreases as the teeth are accustomed to the procedure, but occasional single-day episodes of sensitivity may occur over the



**Figure 1**—Facial view before whitening treatment of the maxillary teeth with 10% carbamide peroxide (left) and after treatment (right). Whitening offers a dramatic esthetic change with minimum cost and effort. The main side effect is tooth sensitivity.



**Figure 2**—The release of peroxide from carbamide peroxide is much different from that of hydrogen peroxide. Hydrogen peroxide releases all of its peroxide in 30 to 60 minutes, with a quick decline. Carbamide peroxide releases about 50% of its peroxide in 2 to 4 hours, then experiences a slow decline.

course of treatment. Whitening treatment time can range from 3 days to 12 months, but sensitivity is not correlated with increased wear time when a lower concentration is used nightly. Tetracycline-stained teeth that have been whitened for 6 months nightly with 10% carbamide peroxide do not exhibit any greater sensitivity than normally stained teeth.<sup>31</sup> Most of the severe sensitivity seems to occur in the first week or two of treatment.

### Tray Influence on Sensitivity

In the author's experience, many improvements in tray materials and designs have reduced sensitivity, especially with the use of a soft, thin tray material.<sup>32</sup> This material minimizes the effect of occlusion on tray movement and reduces the orthodontic pressure of the tray on the teeth. The original tray design used a thick and rigid tray material and extended about 1 mm to 2 mm onto the tissue. This design/material combination caused both tooth and gingival irritation. The evolution to a softer and thinner material greatly reduced the incidence of sensitivity associated with the tray, even when using the original tray design. The use of reservoirs (spacers on the front of the teeth) and a scalloped tray design (trimmed to follow the tooth–gingival interface) was patented<sup>33–35</sup> to further reduce sensitivity by making a tray that did not fit as tightly and avoided contact with the gingivae. Concurrently with this tray design, a thick, sticky material must be used to hold the scalloped, reservoired tray in place. Not all marketed materials work well in this tray design because of their water solubility and the loss of whitening material from the tray (Figure 4).

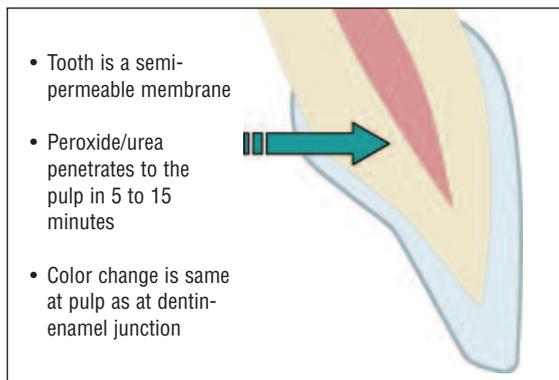
### Passive or Active Treatments for Sensitivity

Most of the earlier treatments for sensitivity involved tray whitening, because the ease of use and universal popularity made it the most commonly used system for tooth whitening. The *passive* approach for treating sensitivity was first used, which included reductions in wear time or frequency of application, or even temporary interruption of whitening. After the interruption, treatment could be resumed with no further sensitivity. Cessation of treatment results in no lingering sensitivity. Although the passive approach has had some success, patients and dentists prefer to use a more active approach.

The *active* approach involves the use of either fluoride, potassium nitrate, or both in combination. Traditionally, fluoride has been used as a method of reducing sensitivity. The primary mechanism of action is the occlusion of dentinal tubules or an increase in enamel hardness, which impedes the flow of materials to the pulp. However, the peroxide molecule is so small that it can travel in the interstitial spaces between the tubules. Hence, fluoride has not been particularly beneficial in managing and treating whitening sensitivity.

### Potassium Nitrate Use in Whitening

Potassium nitrate has a completely different mechanism of action from that of fluoride. Potassium nitrate penetrates the enamel and dentin to travel to the pulp and creates a calming effect on the nerve by affecting the transmission of nerve impulses.<sup>36</sup> After the nerve depolarizes in the pain stimulus response, it cannot repolarize, so the excitability of the nerve is



**Figure 3**—Whitening sensitivity is related to the easy passage of peroxide through the enamel and dentin to the pulp.

reduced. Potassium nitrate has almost an anesthetic effect on the nerve. A recent study demonstrated that applying potassium nitrate for 10 to 30 minutes in a whitening tray could be successful in reducing sensitivity in over 90% of patients, allowing them to complete the whitening procedure successfully.<sup>37</sup> Tray application could be used either before or after the whitening treatment. Because pain can occur remotely from the whitening treatment, potassium nitrate could be used as needed during the day or night. In severe situations, potassium nitrate could be substituted for the whitening material on alternating nights of wear.

There are 2 primary sources of potassium nitrate: professional formulations or OTC products (Figure 5). The most familiar source is desensitizing toothpaste. In the United States, only potassium nitrate at a maximum of 5% is allowed by the Food and Drug Administration to be used in desensitizing toothpastes, because this material and concentration have the best scientific evidence for treating tooth sensitivity. Hence, all flavors of Sensodyne<sup>®a</sup>, a popular desensitizing toothpaste, now contain potassium nitrate (some flavors previously contained strontium chloride or other ingredients), as do all other desensitizing toothpastes (Colgate<sup>®</sup> Sensitive Maximum Strength<sup>®b</sup>, Crest<sup>®</sup> Sensitivity Protection<sup>c</sup>, etc). Desensitizing toothpastes have been shown to be effective, but about 2 weeks of brushing is required for effective sensitivity reduction.<sup>38</sup> Tray delivery of potassium nitrate for 10 to 30 minutes, much like tray delivery of peroxide, seems to be much more effective for acute sensitivity. There is one caution regarding the use of desensitizing tooth-

paste in the tray. Most, but not all, desensitizing toothpastes contain sodium lauryl sulfate (SLS)—the primary ingredient used in most toothpastes, soaps, and shampoos to create foaming. SLS has been associated with increased aphthous ulcers and contact gingival irritation in some patients, and also has been shown to remove the smear layer, inviting more sensitivity. If possible, it is preferable to use a desensitizing toothpaste that does not contain SLS. Using an OTC toothpaste product in the whitening tray to treat sensitivity allows patients to obtain the material when needed and for as long as needed at a reasonable cost. If the patient does experience some gingival reaction to SLS or some other ingredient in the toothpaste, then a professionally supplied product is indicated. Several companies make potassium nitrate and fluoride combinations in a 3% to 5% concentration. These products are contained in syringes much like those used for whitening material and can be applied as needed. Without the additional toothpaste ingredients, there is less chance of gingival irritation. However, there is the dilemma of how much to charge the patient for sensitivity treatment and whether this will be an ongoing treatment using the professionally supplied products. Currently, professional products include UltraEZ<sup>®d</sup> (3%), RELIEF Desensitizing Gel<sup>e</sup> (5%), and Desensitize!<sup>f</sup> (5%). UltraEZ is also available in a disposable single-use tray and could be used with any whitening regimen because no custom tray is required. Further testing regarding the disposable tray's efficacy is needed.

Once research<sup>37,38</sup> determined that potassium nitrate in the tray was successful, the next step was to incorporate this material into the whitening material rather than requiring a separate application. First attempts were not chemically successful, but now most manufacturers make a whitening product containing both fluoride and potassium nitrate. Examples of this are Opalescence<sup>®</sup> PT<sup>d</sup> and Nite White<sup>®</sup> Excel<sup>e</sup>. Early concerns were that either the fluoride or the potassium nitrate would interfere with the whitening process, but a recent study has indicated that whitening efficacy is not reduced.<sup>39</sup> If there is any reduction in efficacy or any increase in treatment time, it is minor, and such outcomes are preferable to the termina-

<sup>a</sup>GlaxoSmithKline Consumer Healthcare, LP, 800-652-5625; www.dental-professional.com

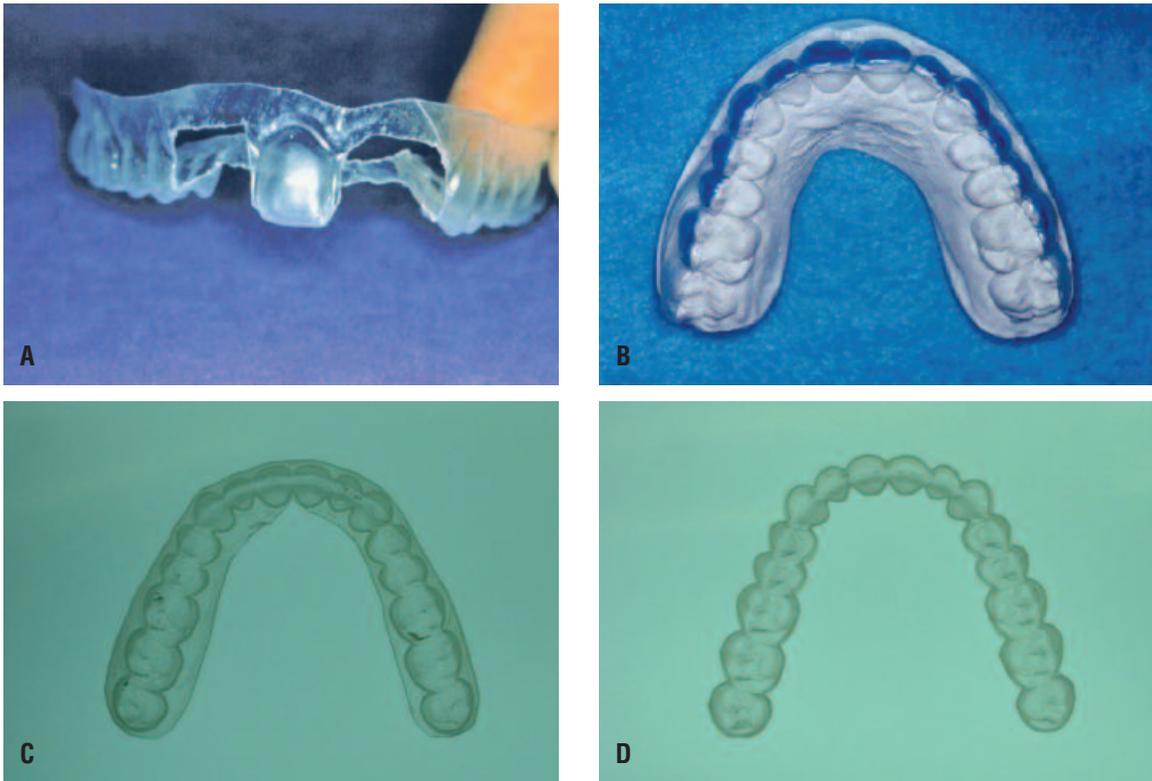
<sup>b</sup>Colgate Oral Pharmaceuticals, 800-2-COLGATE; www.colgate.com

<sup>c</sup>The Procter & Gamble Company, 800-492-7378; www.crest.com

<sup>d</sup>Ultradent Products, Inc, 800-522-5212; www.ultradent.com

<sup>e</sup>Discus Dental, Inc, 800-422-9448; www.discusdental.com

<sup>f</sup>Den-Mat Corporation, 800-972-1236; www.denmat.com



**Figure 4**—Tray design can influence sensitivity and depends on the type of whitening material used, patient concerns/habits, tooth alignment, and gingival condition. (A) single-tooth tray; (B) temporomandibular dysfunction tray; (C) nonscalloped tray; (D) scalloped tray.

tion of whitening treatment because of unmanageable sensitivity. The advantage of having the potassium nitrate in the material is that it also could minimize the effects of mechanical irritation from the tray fit or of occlusion causing movement of the tray.

### Prebrushing With Potassium Nitrate to Avoid Sensitivity

Even though tray application of potassium nitrate was very effective, this approach does not totally eliminate sensitivity. Hence, a more recent study was done to determine another option. Building on the fact that brushing with potassium nitrate takes approximately 2 weeks to be effective,<sup>38</sup> a study was performed in private offices where 1 group of patients prebrushed with toothpaste containing potassium nitrate (Sensodyne) for 2 weeks before initiating whitening.<sup>40</sup> This randomized group was compared to another group that used a conventional fluoride-containing toothpaste. A whitening agent that already contained potassium nitrate was chosen. This product was designed for 30 minutes of wear twice a day and has a low incidence of reported sensitivity. Patients continued to brush with their respective protocol toothpaste during the 2-week whitening treatment.

The group that prebrushed with the potassium nitrate-containing toothpaste had less sensitivity overall (Figure 6), less sensitivity in the first 3 days (Figure 7), and more sensitivity-free days before a first occurrence of sensitivity.<sup>41</sup> Patient surveys reported that the switch to a potassium nitrate-containing toothpaste was easy and well accepted. Patients also were more satisfied with the whitening treatment and were willing to repeat it.

Allowing patients to treat their sensitivity at home offers many advantages. The patient is in control and can apply the material when desired, not only when they can obtain an office appointment. Patients have an active involvement in the treatment, which is simple and cost effective when using an OTC toothpaste. If they have a whitening tray, they can both prebrush and apply the material in the tray as needed. Results with the tray application are fairly immediate. Even without a tray, such as with in-office or OTC whitening, prebrushing has the potential to reduce sensitivity and is easily incorporated into the whitening process.

### Protocol for Treating Sensitivity

Using different approaches to treat sensitivity allows the dentist to customize the patient's

treatment in the following manner.<sup>42</sup> First, there would be a question on the medical/dental form about the history or presence of sensitive teeth.<sup>43</sup> During the examination, the tactile contact of the explorer or a short burst of air can further identify patients with sensitive teeth who may have the potential for whitening sensitivity. Even then, there is no way to predict who will have sensitivity and who will not. However, if the patient is concerned about sensitivity, there are a number of steps that can be taken. The following describes a protocol for night wear of a whitening tray containing carbamide peroxide in a patient with concerns about sensitivity. The dentist may select any or all of the proposed steps:

1. Schedule the patient for a prophylaxis and shade determination, then make the impressions for the tray. Schedule the tray insertion appointment 2 weeks later, and have the patient prebrush for 2 weeks with a potassium nitrate-containing toothpaste. It is best not to initiate whitening at the time of the prophylaxis because of gingival irritation and loss of the smear layer caused by treatment.
2. Plan on whitening 1 arch at a time. Because the smaller teeth are generally more sensitive, starting with the maxillary arch is beneficial because there are fewer small teeth in the arch. Single-arch treatment also allows the patient to monitor the opposing arch to compare progress, which encourages compliance. Wearing only 1 tray at a time reduces the impact of occlusion on the teeth and any sensitivity that may result from those forces. It also is good business sense to have separate fees for each arch, because some patients may elect not to treat the other arch now, or ever.
3. Make a decision about the tray material and

Professional	Over the Counter
<ul style="list-style-type: none"> <li>• RELIEF (5%) (Discus Dental)</li> <li>• Desensitize! (5%) (Den-Mat)</li> <li>• UltraEZ® (3%) (Ultradent)</li> <li>• Included in some whitening systems</li> </ul>	<ul style="list-style-type: none"> <li>• Sensodyne® —all 8 products are 5% potassium nitrate</li> <li>• Crest® Sensitivity Protection</li> <li>• Colgate® Sensitive</li> <li>• Oral-B® Rembrandt® Whitening for Sensitive Teeth</li> <li>• Other toothpaste</li> </ul>

**Figure 5**—There are both professionally supplied and over-the-counter sources of potassium nitrate.<sup>42</sup>

design. Keep in mind that rigid trays have caused tooth sensitivity from tightness of the tray and from trauma to the tissue. Newer products are very thin and flexible and work well. If your tray material is rigid, or if it bubbles, smokes, or splits when heated, you have the wrong material. The author's preference is Sof-Tray<sup>®</sup>,<sup>44</sup> although there are many good materials from other companies. The soft, thin material also minimizes the impact of occlusion on sensitivity. A nonscalloped tray with no reservoirs is a very comfortable tray to use, with the tray formed directly on the cast and trimmed to about 1 mm onto the tissue but not going into the tissue undercuts. This design provides the best fit and uses the least amount of material. Several papers have demonstrated that reservoirs are not needed for more efficient whitening but only to reduce the tight fit of the tray.<sup>44,46</sup> This design also requires a very good alginate impression to avoid an improper fit. Scalloping the tray so as not to extend on the gingival margin also reduces the chances of gingival irritation. If you scallop, you should use reservoirs, because the thick, sticky material required to hold the tray in place will displace the scalloped edges and cause irritation on the lips and cheek. However, application of reservoirs reduces the tightness of the tray's fit. Therefore, a hybrid tray design in which only the anterior 6 teeth are scalloped and reservoired is recommended, because this is where most tissue and tooth sensitivity occurs.

For the remainder of these steps, assume that a nonscalloped, no-reservoir (NS/NR) tray design is being used. This NS/NR tray design can be worn comfortably without requiring a sticky material to retain it in the mouth.

4. Once the tray is fabricated, instruct the patient to wear the empty tray for 1 or 2 nights. Because sensitivity can result from orthodontic forces or occlusion, this trial wear allows for adjustment time. For some patients any sensation is interpreted as pain, so this approach allows them to experience the normal feel of wearing a tray. Some sleep adjustment is necessary for night tray wear, because the tray will cause increased salivation. If the patient is unable to sleep wearing the tray, he or she can use the day-wear approach. However, the day-wear approach will slightly increase the treatment time.<sup>47</sup> If the patient has temporo-

mandibular joint discomfort, a special tray can be made that only covers the facials of the teeth.<sup>48</sup> This tray design requires a thick, sticky material to retain it in the mouth (Figure 4B).

5. After the patient has adjusted to the NS/NR tray, instruct him or her to apply the potassium nitrate–containing toothpaste in the tray for 1 night’s wear. This material application allows the patient to experience the pressure of a thick material in the tray without starting any active treatment and supplements the ongoing effects of brushing with potassium nitrate–containing toothpaste.

6. Use a 10% carbamide peroxide containing potassium nitrate for the whitening process. There also is a 5% carbamide peroxide available with potassium nitrate (Colgate® Platinum Gentle Plus<sup>®</sup>), but the 10% formulation is the most researched concentration to date and has the longest safety studies. Informing the patient about the 10-year study recall<sup>49</sup> on 10% carbamide peroxide, which showed no root canals or ongoing sensitivity, can assure him or her that there are no long-term sequelae to any sensitivity they may experience.

7. It is advisable not to brush immediately before placing the tray, because trauma from the toothbrush to the gingivae may be aggravated by the whitening material.<sup>50</sup> This is the reason why, in clinical research studies, a prophylaxis is not performed immediately before initiating whitening. Also, the SLS and abrasives in the toothpaste will remove the smear

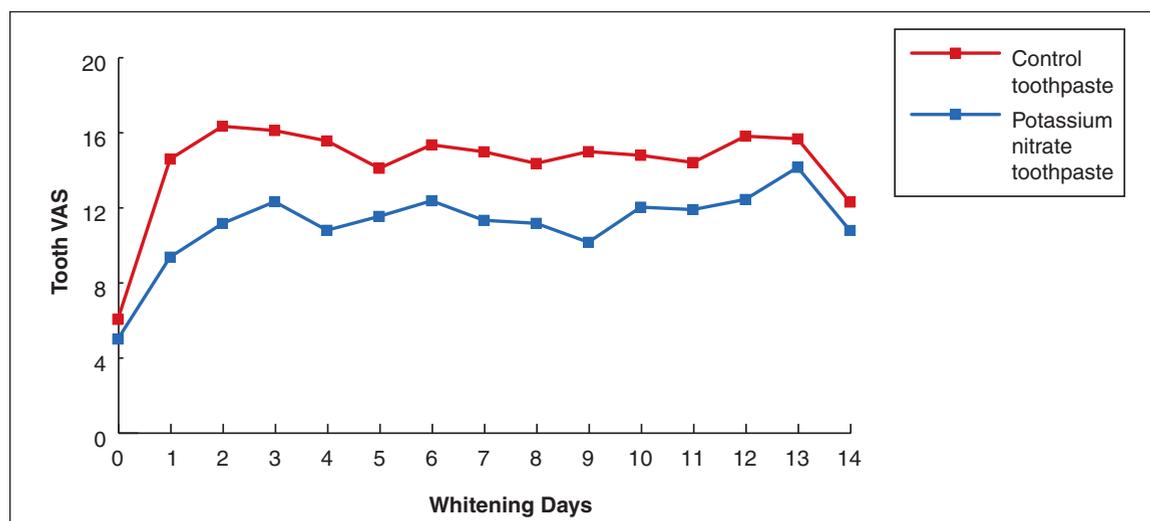
layer. There are a number of dietary concerns for foods and beverages that remove the smear layer because of their low pH<sup>51</sup>; these include cola or soda drinks, white wine, and yogurt.<sup>52</sup>

8. Instruct the patient to wear the tray for a few hours a day if they are concerned about the peroxide causing sensitivity. With day wear, the patient can remove the tray when they experience discomfort. However, starting with night wear usually is the best option, because compliance is better and the patient receives the maximum benefit per application of material.<sup>53</sup> Applying the peroxide more than once a day is associated with an increase in sensitivity.

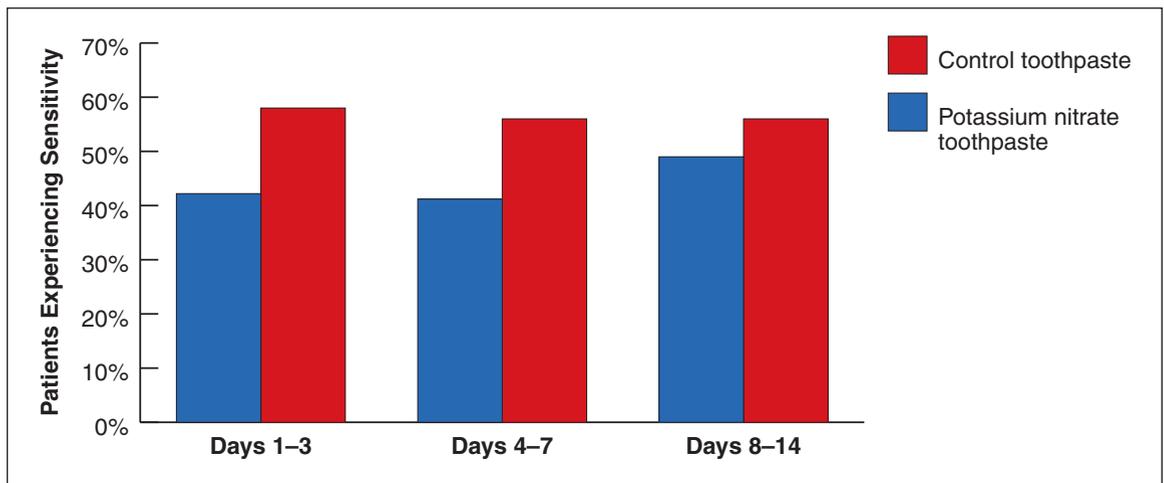
9. Instruct the patient to continue to brush with the desensitizing toothpaste.

10. If uncomfortable sensitivity occurs, the patient may apply the desensitizing toothpaste in the tray for 10 to 30 minutes before and/or after whitening, during the day as needed, or overnight as described earlier. A passive approach of skipping a night after a few nights’ treatment also can be a manageable way to control sensitivity.

All of the previous steps are not needed for every patient but rather provide a plan for the most sensitive patient. Based on this author’s clinical experience, most patients prefer the prebrushing with a desensitizing toothpaste approach and/or skipping a night as needed to manage any sensitivity, especially if they are whitening at night. The tray application pro-



**Figure 6**—Visual Analogue Scale (VAS) values of sensitivity during whitening from a recent study are less with prebrushing for 2 weeks using a potassium nitrate–containing toothpaste (Sensodyne<sup>®</sup>) compared to a regular fluoride-containing control (from *J Clin Dent*.<sup>41</sup> Used with permission).



**Figure 7**—After prebrushing with a potassium nitrate-containing toothpaste, the percentage of patients experiencing sensitivity is less for each group of days of whitening treatment (from *J Clin Dent*.<sup>41</sup> Used with permission).

vides an extra benefit but also requires some wear time during the day. If a whitening method is being used that does not involve a tray, then you do not have this option.

### Other Options for Sensitivity Treatment

A new approach to sensitivity treatment involves the use of amorphous calcium phosphate (ACP). ACP forms hydroxyapatite in the enamel, which reduces fluid flow. It is now found in toothpaste and in whitening products.<sup>54</sup> ACP has been shown to increase the hardness and gloss of enamel by occluding more enamel prism areas. Whether occluding the prisms will be effective on sensitivity without reducing whitening efficacy is difficult to ascertain.<sup>55</sup>

Diet is another factor that may contribute to sensitivity. It has been shown that most cola drinks and especially fruit-based drinks have such a low pH (2 to 2.6) that they remove the smear layer and erode the teeth, increasing sensitivity.<sup>56</sup> This phenomenon also is observed with yogurt, white wine, and other common

foods. These drinks and foods have the same pH as stomach acid and contribute to the erosion of enamel, exposing dentin, much as in a bulimic patient. Exposed dentin is more susceptible to acid erosion (beginning at a pH of below 6 to 6.8) than enamel (5.5), so dentinal tubules are opened up by the erosion and dissolution of the smear layer. The osmotic gradient is caused by sweets or temperature, and fluid flow increases sensitivity (based on Brännström's hydrodynamic theory of sensitivity).

Patients' brushing habits or the type of toothpaste they use also can contribute to sensitivity. Over 50% of the toothbrushes sold in the United States are medium- or hard-bristled, and improper use of an improper brush can further contribute to sensitivity. Some of the tartar control toothpastes, which are effective by altering the tooth surface such that tartar will not adhere, also have been correlated with increased sensitivity. Toothpastes aimed at removing tobacco stains are highly abrasive and can further damage teeth and cause sensi-



**Figure 8**—Tray application of potassium nitrate-containing toothpaste (left) for the treatment of tooth sensitivity caused by whitening, exposed dentin, or prophylaxis (right).

tivity. Additionally, teeth should be evaluated for nonwhitening causes of sensitivity, including tooth decay, abscessed teeth, cusp fractures, and abfractions.<sup>57</sup> A good dental examination performed before whitening begins generally includes a periapical radiograph of the anterior teeth, and always a radiograph of any single dark teeth. Parafunctional habits such as nocturnal bruxism can contribute to teeth being more likely to incur sensitivity. Periodontal surgery for root coverage after recession can be an effective treatment to reduce sensitivity, provided that bonding has not been performed on the root surface.

### Nonwhitening Sensitivity Treatment

The use of potassium nitrate toothpaste for prebrushing and for tray delivery already has been reported to reduce sensitivity in postperiodontal surgery patients, where more cementum and dentin have been exposed from the surgery.<sup>58</sup> Applying this concept, another interesting use is for patients for whom sensitive teeth make even a mere prophylaxis a problem. These patients, in addition to routinely using a potassium nitrate-containing toothpaste, also can have a whitening-style, NS/NR tray fabricated (Figure 8). The patient can then wear the desensitizing material in the tray while going both to and from the dental office for the prophylaxis. This approach again affords the patient an active way to reduce sensitivity from the prophylaxis as well as reduce their anxiety about having their teeth cleaned.

### Conclusion

Many options exist for treating whitening sensitivity. Prebrushing with a potassium nitrate-containing toothpaste can reduce or avoid sensitivity from whitening. Tray application of potassium nitrate can be an effective episodic treatment for sensitivity. Treatment time variations, use of different concentrations of material, and varying tray designs all can be part of a sensitivity management program. It is far better to try to avoid or minimize sensitivity using these methods than to treat sensitivity after it occurs. Even with all of these options, there are still some patients who cannot manage their sensitivity and elect to terminate the whitening treatment. Sensitivity seems to be a multifactorial event that cannot be entirely controlled in every patient. Additionally, some patients may have an exaggerated response to

any dental treatment, for which other treatments including psychological counseling are required.<sup>59</sup> However, the majority of patients, after a proper dental examination, history, and radiographs, can find an appropriate method—ie, adjustment of treatment time and material, brushing with a desensitizing toothpaste containing potassium nitrate, or tray application of potassium nitrate—to minimize any sensitivity they may encounter and successfully complete the whitening process.

### Disclosure

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