

The Dental Learning Network



A Simple Guide to Tooth Whitening

2 Homestudy Credit Hours

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A Simple Guide to Tooth Whitening

(2 Credit Hours - \$30.00)

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Course Objectives

Upon completion of this course, the student should be able to:

- Appreciate the impact the whitening boom has had on modern dentistry
- Identify the different types of whitening procedures
- Understand the pros and cons of each procedure
- Know the potential side effects of tooth whitening
- Understand the techniques associated with each whitening procedure
- Understand the complexity of the tooth shade

Course Introduction

For many dental professionals, the concept of esthetic dentistry is a relatively new one. However, the idea has been used in dental offices since the late 1800's. It is only with the recent advent of enamel and dentin bonding and the subsequent improvements in materials and techniques that this portion of oral health care has been thrust into the forefront. For many individuals, having a great smile is a very important part of their overall appearance. Whether a person is in business, entertainment or sales, having a great smile can be vital in making a good impression. A fantastic smile is an accessory you always carry with you and patients are willing to pay a premium for it.



Over the years, teeth undergo wear and tear just like anything else. Whether it is chipping from trauma, wear from bruxism or stain from dietary factors, teeth can often appear less than perfect. For those patients unhappy with their smile, modern dentistry has many ways to restore that picture-perfect smile.

In The United States in 2000, it was estimated that some 54% of the adult population drank coffee everyday - that's well over 100 million people! Add that to the approximately 40 million smokers and countless numbers who drink tea and red wine and you have a significant percentage of the population with stained teeth. This, coupled with the increased demand for esthetics, has produced a tremendous market for tooth whitening.

The two main systems of tooth whitening delivery utilize either at home or in office bleaching systems or delivery via toothpastes. There has been a recent boom in the production and sale of tooth whitening products. The American Academy of Cosmetic Dentistry says that the teeth whitening industry has grown more than 300% from 1996 to 2000. As of 2004, in the U.S. alone, it was a 500 million dollar a year industry. With the recent increase in popularity of "makeover" reality television shows, the signs only point to further growth.

About the Author

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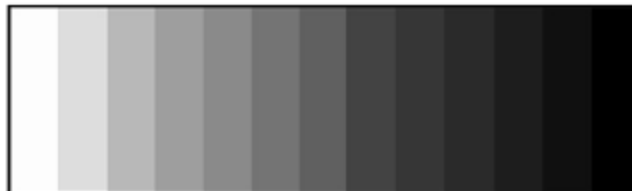
Why do Teeth Darken?

Introduction

Over the years, teeth undergo significant changes in both their shape and appearance. It is highly unlikely that a dentition will appear the same at age 70 as it did at age 20. Most of these changes are a result of normal wear and tear that teeth undergo over a lifetime. Changes in the shade of the teeth are inevitable over time. There are numerous factors that affect both the color and brightness of teeth.

Properties of Light and Color

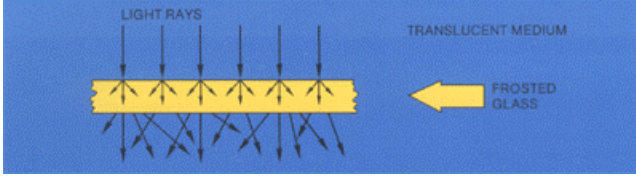
In order to understand the changes in a tooth's shade, it is important to understand the factors that quantify that shade. These three main factors are hue, value and chroma.¹ These are the three main characteristics of color. The dictionary definition of hue is this: The property of colors by which they can be perceived as ranging from red through yellow, green, and blue, as determined by the dominant wavelength of the light. So what does that mean? Essentially it means that hue is the main color or combination of colors present. If a shirt is red, the hue is red. If a car is green, the hue is a combination of yellow and blue. It is the quality that distinguishes one color from another.¹ With teeth, the differences in hue are pretty subtle. Chroma is the saturation or intensity of hue. Red and pink have the same hue. However, red has a high chroma while pink has weak chroma. Likewise, maroon would have a higher chroma than both red and pink. Finally, value is the brightness of the color. It is the most important factor in shade matching because the human eye is very sensitive to changes in value. On a scale of black to white, white has a high value, while black has a low value. Grey falls in the middle of the value scale.



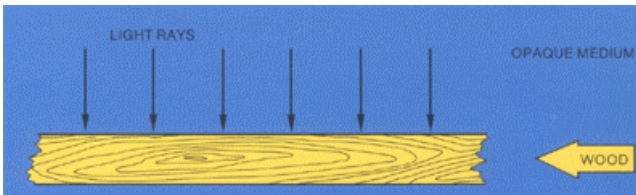
When light falls on an object, it is either reflected, transmitted or absorbed. If all the light is reflected, the object will appear white. If all of it is absorbed, the object will appear black. In the case of teeth, reflection, transmission and absorption all occur simultaneously to varying degrees.

Properties of Teeth

Natural teeth have both translucent and opaque qualities. Translucency means that when light is transmitted through an object, it scatters, or diffuses instead of going straight through. To get a better picture of diffusion, think of the frosted glass often used for bathroom windows. Enough light passes through that allows an object to be seen, although very indistinctly. Similarly, enamel has translucent properties.²



Opacity means that light is unable to pass through at all. An example of this would be a wooden door. Light may pass under or around the door, but not directly through. The dentinal layer of a tooth is an example of an opaque medium.²



When light hits an anterior tooth, the light is transmitted through the translucent enamel layer. In the incisal edge where no dentin is present and the enamel layer is thinnest, the light has less to pass through. Here the tooth appears at its lightest. The cemento-enamel

junction of the anterior tooth is the thickest part. Here, the light diffuses through the enamel layer and is either absorbed or reflected by the dentin. The translucency pattern contributes to the shade by affecting value.¹ Over time, due to toothbrushing and normal wear, a portion of the enamel is lost. This is important because any change in the translucency affects the value of the tooth shade. Loss in enamel thickness allows the darker dentinal shade to dominate.¹ This will become an important factor when trying to anticipate whitening success in older patients. We will discuss this in more detail later in the course.

Extrinsic Staining vs. Intrinsic Staining



Whitening success depends largely on the type of staining present in a dentition. Intrinsic staining is stain that was incorporated into a tooth, either while the tooth was developing or after it has erupted. There are a few main culprits that cause intrinsic staining. The first is through high systemic intake of fluoride during the development of the tooth. Tooth development occurs constantly from the second half of fetal

development until approximately age 18. Too much systemic intake of fluoride causes a condition called fluorosis or mottled enamel. In most cases the enamel of the tooth will appear white and chalky. However, sometimes it will appear brown. Either way, bleaching can be used to reduce the contrast of the mottled enamel to healthy enamel and make the condition less noticeable. Sometimes, though, surface defects or "pits" may be present as well making other restorative procedures (veneers or bonding) a more esthetic option. Whitening these teeth prior to restoration is a good idea to give a more consistent shade underneath the restoration.



Another cause of intrinsic staining is medications; more specifically the antibiotics tetracycline and minocycline. Use of these antibiotics during tooth formation can cause a bluish-grey stain on the portion of the tooth developing at the time of use. Severity of staining will differ depending on the type and

duration of use. Minocycline is a derivative of tetracycline and the staining appears similar in both. However, they differ in that minocycline can stain teeth both during development and after eruption.^{3,4} This drug use to be widely prescribed for treatment of acne though, due to this side effect, it has fallen into disfavor. The mechanism by which minocycline stains teeth is not fully understood at this time. Prolonged bleaching can drastically diminish the appearance of this staining but can never fully remove the discoloration. Patients are often unsatisfied with the result and will require veneers or bonding to restore.

Perhaps the most common cause of extrinsic staining for already erupted teeth is trauma. Trauma to a tooth induces an inflammatory reaction consisting of hemorrhage from the pulp into the dentinal tubeles. This causes a slight pinkish change in the color, often only noticeable in the gingival 1/3 of the tooth. As the hemoglobin breaks down, it leaves iron sulfide in the tubules, which produces a darker black color. This type of staining typically responds well to prolonged whitening. Likewise, if a tooth becomes necrotic secondary to trauma, a similar process occurs. However, treatment in this case includes root canal therapy to remove the necrotic material.³

Other causes of intrinsic staining are hereditary. Imperfections in the formation of either enamel or dentin can cause discolored teeth. Both amelogenesis and dentinogenesis imperfecta, along with enamel hypoplasia are examples of hereditary causes of intrinsic staining. Diseases like porphyria can also cause discolored teeth due to excess porphyrins in the blood during mineralization of the teeth. Affected teeth are usually pinkish brown.⁵

Age also causes an intrinsic discoloration of teeth. This is due to changes in the physical composition of the tooth. Over the years, layer of enamel are lost, exposing more of the darker shaded dentin. Likewise, reparative dentin is formed over time and any pigments present in the systemic circulation at that time can be incorporated into the tooth. Dental restorations can also cause changes in tooth color. Amalgams restorations can give a tooth a grayish-blue appearance even if the restoration itself is not visible. This is less common today with the improvement and increased utilization of multi-shaded composite resin restorations.



Extrinsic staining is far more common than intrinsic staining. Extrinsic stains are those that cling to the exterior of the tooth or penetrate into the very outer layers of enamel. A majority of staining is caused by the interaction of pigments from food and beverages with the plaque covering the enamel surface. This plaque, and consequently the stains as well, are removed at each dental recall appointment. When stains penetrate the microscopic cracks and fissures of the teeth, they cannot be removed by toothbrushing or dental cleanings. The most common causes of extrinsic staining are coffee, tea, red wine and smoking. These four culprits are all things that most people are not willing to give up just to have whiter teeth. This is one reason for the optimistic outlook on the future of the tooth whitening industry.

Tooth Whitening Options

Introduction

The number of tooth whitening options available today is enough to makes most consumers heads spin. The emerging popularity and expected growth of whitening has prompted many manufacturers to develop products for use both over-the-counter and in the dental office. Here we will try to make heads and tails of all the options so you can give your patients the best advice as to what type of bleaching is right for them.

Whitening Toothpastes

The concept of whitening toothpastes has been around for many years. As far back as the 1970's, products such as Pearl Drops have been promising consumers brighter smiles. However, the original wave of whitening toothpastes worked because they were extremely abrasive and actually took off layers of enamel along with the stain. Modern versions of whitening toothpastes are much more tooth friendly and, if used regularly, can help to maintain whiter teeth. The key word here is MAINTAIN!

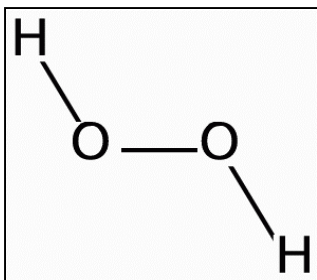
Whitening toothpastes, and all whitening products in general, work in one of two ways. Some contain a bleaching agent that actually changes the shade of the tooth while removing both intrinsic and extrinsic staining. Others contain a detergent material that physically remove only extrinsic stains in the outer layers of enamel making no change to the actually shade of the tooth.⁶ Whitening toothpastes fall into the latter category. They help remove surface stains through use of a mild abrasive. This abrasive works to physically remove stains from the surfaces of teeth similar to the way a sponge works on a dish. Silica is the most common form of abrasive used today. Others are alumina and dicalcium phosphate. Some toothpaste may contain an additional chemical or polishing agent to bolster its effectiveness. Common examples of these are peroxide, titanium dioxide and baking soda. However, none of these products actually alter the shade of the tooth. They remove stain accumulation, and in some cases, help prevent extrinsic stain accumulation to reveal your natural, lighter, tooth shade.



When recommending toothpaste, or any dental product for that matter, to your patients, it is always a good move to tell them to look for the ADA seal of approval. This way you know they are going to be using a fluoride-based toothpaste that will help fight tooth decay. After that, it all depends on what their preferences are. However, it is important to make sure your patients understand the limitations of whitening toothpastes. I recommend them as a good way to help maintain their brighter smile after a dentist supervised whitening treatment has been completed. Some research has shown the toothpastes containing the chemical sodium hexametaphosphate (Crest Dual Action Whitening) actually help to reduce accumulation of extrinsic stains. However, this research is limited and in no way conclusive on the subject. The take home message for patients is that toothpastes on their own will not whiten teeth the way in-office or at-home peroxide based treatments can.

Hydrogen Peroxide vs. Carbamide Peroxide

If you were to look at the active ingredients for many whitening products, the main one would be either hydrogen or carbamide peroxide. It is important to understand the difference between the two so you, as a dental professional, can assess the slew of products that you will inevitably encounter.

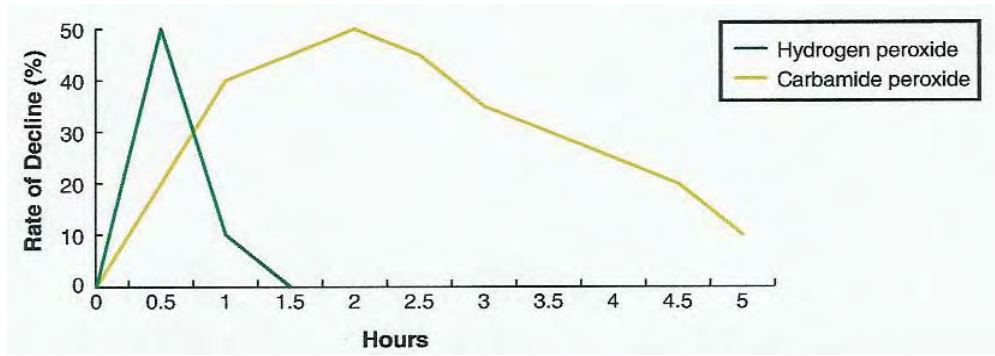


Hydrogen peroxide is something that most people are familiar with, even if they are not in the dental profession. It is commonly sold as a household antiseptic in a 3% solution for treatment of minor cuts and scrapes. Its chemical formula is H₂O₂. A man named Louis Jacques Thenard discovered it in 1818. Hydrogen peroxide is an oxidizing agent. Its bleaching action results from the oxidation of hydrogen peroxide into water and oxygen. This process releases free radicals that oxidize larger pigmented molecules into smaller, less visible molecules.⁸ Since most people have a hard time understanding the chemistry behind this reaction, I just tell them to visualize the free radicals as little scrubbers that clean the stains from teeth. That's overly simplified, of course, but it's something that everyone can understand. The hydrogen peroxide gel used in whitening procedures varies anywhere in concentration from 3% to 40%. Obviously, the higher concentrations require far less time to work but have a higher incidence of side effects.

Carbamide peroxide is, very simply, hydrogen peroxide compounded with urea. It is also called urea peroxide. The urea serves no function in the whitening process. This means that essentially the active ingredient in both is hydrogen peroxide. So why not just use hydrogen peroxide? Good question. It seems the urea added to hydrogen peroxide helps stabilize the formula giving carbamide peroxide a more predictable and longer shelf life.

In the presence of water, carbamide peroxide degrades into urea and hydrogen peroxide at a ratio of about 6.5 urea to 3.5 hydrogen peroxide. This means that a 10% carbamide peroxide gel is equivalent to a 3.5% Hydrogen peroxide gel in terms of its bleaching effectiveness. The chemical formula of carbamide peroxide is CH₆N₂O₃. In dental whitening, the gel used is typically in the 10-22% range. The 10% concentration was the original standard for at-home bleaching procedures due to its combination of safety and effectiveness though, presently, products incorporate both hydrogen and urea peroxide.

An important difference in the two concerns the rate that each releases hydrogen peroxide. Carbamide peroxide is a more stable molecule and it, therefore, breaks down more slowly than straight hydrogen peroxide. 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.¹⁰ It acts in more of a time-release fashion. Hydrogen peroxide breaks down almost immediately, releasing its peroxides entirely within the first hour.¹⁰ It is thought that due to this immediate bombardment of peroxides on the pulp, hydrogen peroxide produces more sensitivity than carbamide peroxide of a comparable concentration.



In Office Tooth Whitening

Light or No Light

Tooth whitening options are typically categorized based upon where the procedure takes place. "In office" bleaching is typically a 1 hour procedure using anywhere from 20% to 40% Hydrogen Peroxide. Some systems require a catalyst of some sort, usually either a light (BriteSmile, Zoom), heat or chemical (Opalescence). Heat is no longer used due to its negative effects on the pulp. Patients reported extreme temperature sensitivity and, in some cases, even pulpal necrosis after receiving a treatment utilizing a heat catalyst. Light is the predominant catalyst used today and the research has proven it to be a safe method to whiten teeth. The question is just how necessary is the light to the process? Lets discuss this.



This question has raised some controversy in the dental community. As I stated earlier, many in-office whitening products utilize some sort of light in the procedure. In fact, for some systems, the light is actually their calling card. The thinking behind this is the light acts as a catalyst for the degradation of hydrogen peroxide into oxygen free radicals. A catalyst is something that increases the rate of a reaction. So if the hydrogen peroxide gives off free radicals at a faster rate, the teeth will whiten faster. Right?? Not so fast my friend. Several studies have shown that the benefit of the

light, if any, is pretty much negligible. These studies utilized a split-arch evaluation of a whitening system utilizing a light on one half of the arch and no light on the other half. The conclusion reached is that the results were the same regardless of whether a light was used or not. Ok, so the lights don't work. Well, actually, the dental companies that produce the light catalyzed whitening systems have produced their own research saying the light improves whitening results by "up to 26%⁹." They claim that the light only works on their hydrogen peroxide gel because they have added the catalyst to the gel. The light activates this catalyst and improves results.

So whom do you believe? It is important when evaluating research to carefully examine the methods used and the people behind the study. Look for research done by people who are independent and who stand to gain nothing from obtaining a certain result. If Company A's research says that Company A's product is great, look for another study done independent of Company A that corroborates those results before accepting them. Always be skeptical. The research on this subject is inconclusive at this time. A majority of it says that any benefit of a light in the whitening process is minimal.

The bottom line is this; what is best for you in your office on your patient population? Some patients want to think that their dentist has all the newest technology and they are willing to pay a premium to get the latest procedures. If your patients are happy with the results that they get from whitening visits under the light, then what more could you ask for? Is a light necessary to get good results...absolutely not?

The Procedure

A majority of the in-office tooth whitening systems on the market today are very similar in terms of the protocol involved. The first step in any whitening procedure should be to discuss the patients' goals and the expectations. Make sure that the result that they have in mind is a realistic one. For instance, older patients whose teeth are somewhat gray will not whiten as well as a younger patient whose teeth are yellow. Previously placed composite resins will not whiten along with the teeth – the patient needs to know this prior to the procedure and a plan should be put in place in case these fillings are mismatched once the desired shade is reached. It is also important to also explain to them the complications that may arise along the way – the most common of these being sensitivity. Having a consent form prepared is an easy way to ensure that the patient gets all the necessary information prior to treatment. Next, obtain a starting shade using a shade guide and, if possible, take pictures of the patients smile prior to treatment. Next, the teeth should be cleaned using pumice and a prophy cup to remove any plaque that may be coating the teeth. Now the patient is ready for the procedure.



Since most of the systems use high concentration hydrogen peroxide (25%-35%), it is important to protect the gingiva adjacent to the teeth being whitened. This can easily be done using a rubber dam that will expose only the tooth while ensuring the gums do not contact the hydrogen peroxide solution. Some companies include a protective gel with their systems as an easier way to avoid peroxide “burns.” However, having used these myself in the past, I can tell they are technique sensitive and I have had varying degrees of success while using them. These gels require that the gingival stay very dry throughout the process to remain intact along the necks of the teeth. Once moisture is introduced, they can easily become displaced. If the peroxide gel does come into contact with the gingiva, it temporarily turns the area of contact white. This color change will usually last for a few hours before the original color returns. However, knowing that hydrogen peroxide has mutagenic properties, it is best to take extra care to keep this from occurring.

Now you are ready to begin whitening the teeth. Most systems use three 15-minute applications of the hydrogen peroxide gel. The patient's teeth can be put under a light during this time. Many offices provide some sort of entertainment for the patient during this time (television, magazines, radio). After each 15-minute period, the hydrogen peroxide gel is rinsed off, a fresh batch is applied and the procedure is repeated. After one hour the gel is removed, the teeth rinsed and the tooth shade is checked. Be sure to show the patient the before and after shade so they can more easily see the changes. This procedure can be repeated as many times as required to gain the maximum whitening result.

Patients will invariably ask you “how long will my teeth stay white?” With whitening, as with any procedure done in the dental office, there is no way to know for sure how long anything will last. Result longevity depends on several factors. If the patient drinks 5 cups of coffee in the morning and a glass of red wine at night, their teeth will begin the slow darkening process as soon as that first drop crosses their lips. For this type of person, usually 6 months to a year is a realistic expectation. In an ideal patient who avoids food and beverages that stain teeth and is not a smoker, usually 3 years is a realistic expectation. It

is important that patients understand that darkening of the dentition is a natural part of the aging process and is as unavoidable as dealing with the IRS every spring.

Non-Vital Whitening



First let us discuss why non-vital teeth darken. When a tooth undergoes trauma and the pulp begins to become necrotic, blood is released as a part of the inflammatory process. This blood becomes trapped in the dentinal tubules and, as it breaks down, blackens these tubules. Non-vital teeth often respond relatively well to vital bleaching techniques, however, it is often very difficult to get an exact shade match to its vital counterparts in the mouth. There are a few reasons for this. First, and probably most importantly, when a root canal is performed and the nerve and blood supply is removed, the opacity of the tooth changes. The complexity of the tooth shade (the hue, chroma and value) makes it difficult to artificially recreate a vital tooth without the use of fixed prosthetics (crowns, veneers). However, it is possible, with vital and non-vital bleaching techniques, to come close.

Internal bleaching is possible only after a root canal has been performed. The first step is to isolate the tooth from the rest of the mouth using a rubber dam. This is done to ensure that the bacteria from the mouth are not introduced to the pulp chamber. Then, the gutta percha is removed from the coronal portion of the pulp chamber to the approximate level of the cemento-enamel junction. This should only be done after the endodontic cement has had a chance to fully set. It is advisable to use non-eugenol based endo cement in order to avoid contaminating any portion of the tooth with eugenol. Eugenol inhibits bonding of composite resins that are necessary in order to seal off the gutta percha and to later restore the tooth. This brings us to the next step, sealing the gutta percha off from the coronal portion of the tooth. This is done for a very important reason. Studies have shown that internal resorption can occur if bleaching products seep into the root canal space. It is important that any bleaching materials placed in the coronal portion of the tooth be sealed off from the endodontic fill to avoid this problem. Likewise, it is a good idea to seal the coronal portion of the endo fill as a safeguard against possible loss of the seal at this end. This can be accomplished using composite or a glass ionomer and whatever bonding protocol you typically use.

After the prep work is done, the bleaching agent is introduced into the pulp chamber. The chamber is sealed with a temporary filling material and the bleaching agent is left in the chamber for up to a week. At the end of this time period, the gel is rinsed out and replaced until the desired shade is obtained. This procedure is also known as the walking bleach technique and is aimed at removing the intrinsic staining left behind by the necrotic pulp and blood supply. In order to get the most ideal result, this technique should be coupled with either in office or take home bleaching to remove extrinsic staining in the enamel.

Traditionally, superoxyl (35% Hydrogen Peroxide) is the whitening agent used for this procedure. However, today there are a bevy of options out there to try and, as with all dental products, you should do careful research to find which are safe and effective. Overall, the products geared towards non-vital whitening will be high concentration hydrogen peroxide and are interchangeable with those used for other in office whitening procedures.

At Home Tray Whitening

At home whitening is still the most popular whitening procedure performed. This procedure utilizes custom fabricated trays to deliver the whitening component (in this case typically 10%-20% carbamide peroxide) to the teeth. This technique is time tested and known to be very safe and effective.

The first step in this procedure should be to discuss the treatment with the patient. Talk to them about their expectations and try to get them to set a reasonable goal for themselves. The patient should also be aware of any potential side effects that can accompany whitening. Also, make sure the patient has recently had their teeth cleaned. Whitening is not effective on teeth coated in plaque.

Next, an alginate impression is taken and the model is poured up in either plaster or stone. Here, some practices will make the bleaching trays in-office while others send them to a lab to be made. Either way, the procedure entails using a thermoplastic material to make the trays. This means that they can be heated up and molded to fit each tooth precisely. Once the tray material is heated, it is sucked down over the patient's model using a vacuum. After the tray is allowed to cool, it is then trimmed so that it only covers the teeth. A properly trimmed tray will make a seal that will inhibit the flow of whitening gel from the tooth onto the gingiva.¹² This is important because improper trimming of the tray can cause peroxide to overflow from the tooth onto the gums. If the peroxide contacts the gingiva for an extended period of time, the patient's gums will become irritated. Trimming the tray correctly ensures that any excess peroxide can be removed from the gingiva.



The tray is now ready to be delivered to the patient. This appointment involves ensuring the trays fit comfortably, going over the proper way to dispense the whitening gel, including how much to use for each tooth, and establishing a baseline shade so that the patient's progress can be monitored. Another way to do this is to have the patient whiten

only one arch at a time. This way they can easily see the progress they are making. I typically advise my patients to only use their trays for a 1-2 hours at a time at first. This will give them a chance to get used to having the trays in their mouth and also gauge how severe any sensitivity they might experience may be. They can then progress up to the point where they keep the trays in overnight and maximize each use. Once the patient begins the at home bleaching process, make sure they know that they can contact you in case they have any problems or questions.

The at home whitening process has a few pros and cons compared to in-office whitening. The pros are that the patient can continue to whiten their teeth until they reach their desired shade. More importantly, after the initial treatment, the patient still has the trays and access to the whitening material so they can touch up their smile as often as they like. In-office procedures require the patient to pay for each visit and typically, the results do not last as long. Likewise, the incidence of sensitivity is less for at-home whitening as compared to in-office due to the lower concentrations of hydrogen peroxide used. The major complaint with at-home bleaching is the time required to reach a desired shade. Typically results are seen in the first few days but it may take 1-2 weeks to reach the desired shade. With in-office

whitening, dramatic results can be seen in only one hour. Also, some people don't like the idea of having to wear the whitening trays.

Introduction

Tooth whitening is a very safe procedure when performed correctly. However, the process can cause certain side effects that you, as a dental professional, must inform the patient about prior to the procedure.

Sensitivity



The most common side effect, by far, of any whitening procedure is tooth sensitivity. This problem affects, to varying degrees, upwards of 75% of whitening patients.¹⁰ Some patients' teeth get so sensitive that even breathing can be painful. So how can this be avoided? Firstly, as with any dental procedure, informing the patient of this side effect prior to treatment will greatly help you as the practitioner if and when this problem occurs. If you let the patient know before the treatment, then when it happens, it's just a side effect of the procedure. If you don't inform

them of potential complications before treatment, it can make you look bad should complications arise. Patient communication is essential to keeping patients happy.

Recent studies have shown that using anti-sensitivity toothpaste for the two weeks prior to whitening treatment has helped reduce instances of sensitivity. Patients experienced both less sensitivity overall and more sensitivity free days. The toothpaste used in the studies contained potassium nitrate, which has been shown to be very effective in both preventing and alleviating this problem. Research has shown that potassium nitrate actually travels down the dentinal tubules to the pulp and provides a calming effect. It does so by affecting the excitability of the nerve. Once the nerve initially fires, the potassium nitrate does not allow the nerve to repolarize producing an anesthetic-like effect.¹⁰ Some newer formulations of whitening agents (NiteWhite Excel 2Z and Rembrandt XtraComfort) actually contain agents to help decrease the incidence of sensitivity. These include sodium fluoride and the previously mentioned potassium nitrate.

Some practitioners have begun to instruct patients to take NSAIDs (Ibuprophen, Naproxen) prior to whitening. The thought behind this is that sensitivity in large part is due to temporary pulpal inflammation. If the patient already has an anti-inflammatory drug in their system during the whitening procedure, the pulpal inflammation will be lessened and so will the sensitivity. To my knowledge, no studies have been done to validate this treatment, but in theory, the principles are sound. Of course, you must ensure the patient is able to take these drugs before advising them to do so.



Another way to help avoid sensitivity issues is by ramping up the duration of your whitening sessions. This is more easily done if using at home whitening method. Instruct the patients to whiten for a period shorter than the product instructs. Most 10% carbamide peroxide gels are left in overnight. For these products, instruct your patients to begin

at 1 hour and gradually increase the time if no sensitivity occurs until they are able to leave the trays in overnight. Some patients have no problems with sensitivity and are able to use the strongest whitening product in order to get the fastest results.

Make a note in the patients chart concerning any sensitivity they may experience, the intensity of the problem and duration. The studies that have been done on 10% carbamide peroxide have shown no long-term effect of sensitivity or instances of pulpal necrosis so you can reassure your patient that the sensitivity is not a permanent problem.

Gingival Irritation

Another potential side effect of the whitening process is gingival irritation. This occurs when the bleaching agent comes into contact with the gingival tissue. During in-office bleaching where higher concentrations of hydrogen peroxide are used, short-term exposure is all that is required to cause irritation. For at home procedures, longer exposure produces the unwanted side effect. Regardless of which type of procedure is used, this problem can be a non-issue as long as strict adherence to the protocol is observed. For at home whitening, this can only happen if the patient knows the correct protocol concerning the amount of material to put in the tray and the proper way to clear excess gel off of the tissue once the tray has been seated. Make sure your patients are informed prior to the procedure and it will save many post procedural headaches.

Gingival irritation, like sensitivity, is a temporary side effect that can easily be managed. When high concentrations of hydrogen peroxide come into contact with the tissue, they will often turn the tissue dead white. This can happen when the whitening gel slips through gaps in the dental dam. The can often shock patients when they first see it. However, you can assure them that the tissue will return to its normal color within 3 hours. A more common problem occurs with at home whitening. Patients are often overzealous when placing the gel into the whitening trays. Since the trays are form fitting, only a specific amount of gel will fit into each tooth space. An overfilled tray will spill the excess gel onto the gums when it is seated in the mouth. If allowed to remain on the gingiva, the gel will cause irritation where in contact with the tissue. After placing the tray over the teeth, the patient should clear away any excess gel using either a toothbrush or their finger. Likewise, each tray should be trimmed so that they do not overlap the gums and allow the gel to contact the gingiva.

GI Mucosal Irritation

This topic is often breezed over during discussions of whitening side effects and probably rightly so. However, an informed patient makes a happy patient and they will appreciate any heads up they are given concerning potential problems. GI mucosal irritation is primarily a problem during overnight take home bleaching procedures. During the night, some of the bleaching gel is inevitably swallowed. Depending on the peroxide content of the gel swallowed, mucosal irritation can occur. This usually manifests itself in the form of a sore throat and like other whitening side effects, is transitory in nature.

The best way to limit this problem for your patients is to ensure that the trays are well made. Successful isolation of the bleaching product from the rest of the oral environment goes a long way in limiting problems. Likewise, patient education on how to properly fill the trays and what amounts to use helps as well.

Too White?

A very popular saying and one I hear often is “beauty is in the eye of the beholder.” Clichéd for sure, but true nonetheless. I remember a television show I saw once in which one of the characters got his teeth whitened prior to a big date. However, he fell asleep with the bleach on his teeth and when he woke up, his teeth were incredibly, ridiculously white. So much so that they actually glowed in the dark. Now we know that doesn’t really happen but it does bring up an excellent question; what is too white?

I’m not sure if you’ve noticed yet but I’m a big fan of telling patients what to expect. Part of that is giving them as good an idea as you can about what they can expect their results to look like. I always advise my patients to try and keep their smiles looking natural. Personally, I think that when teeth get too white, they can draw attention to your smile for the wrong reasons. The first thing a person should notice is the quality of the smile, in general, and not the whiteness of the teeth. Having really white teeth is not the same as having a great smile. My mother whitened her teeth recently and she kept telling me that people didn’t necessarily notice that her teeth looked whiter. Instead they told her that she looked younger though they couldn’t pinpoint exactly why. To me, that is a successful whitening treatment. However, my goal as a dentist is to have orally healthy, happy patients and as long as they are paying the bills, they have the final say in “how white is too white?” All we as practitioners can do is to advise them and give our opinions but in the end, what they deem beautiful is what should be.

Conclusion

If you are not already utilizing some sort of whitening procedure in your office, you should begin soon. It is a great service to patients and certainly on that is in demand. For you and your staff it's a relatively easy and stress-free procedure. Most importantly though, it's an easy way to make patients happy with the smile they have and happy patients keep coming back.

In Office Whitening Products¹¹

Company	Brand	Type	Percent	Time
Ultradent Products	Opalescence Xtra	Hydrogen Peroxide	35%	As needed
	Opalescence Xtra Boost	Hydrogen Peroxide	38% + activator	As needed
Discus Dental	White Speed	Hydrogen & Carbamide Peroxide	18% H ₂ O ₂ + 22% carbamide peroxide = 35% carbamide peroxide equivalent	30 minutes
	ZOOM!	Hydrogen Peroxide	25%	3 - 20 min sessions
Denstply	Illumine'	Hydrogen Peroxide	30%	15-60 min
BriteSmile		Hydrogen Peroxide	15%	60+ min

Brand	Light Activation	Misc.
Opalescence Xtra	Yes	
Opalescence Xtra Boost	No	Syringe to syringe mixing, 7.0 pH
White Speed	No	Custom Trays, equivalent to 13.2% H ₂ O ₂
ZOOM!	Whitening Lamp	
Illumine'	No	Syringe to syringe mixing, Custom trays
BriteSmile	Yes	7.0 pH

Professional Take Home Bleaching Products¹¹

Company	Brand	Type	Percent	Time	Misc.
Ultradent	Opalescence	Carbamide Peroxide	10 %	8-10 hrs	Reg, mint, or melon
	Opalescence F	Carbamide Peroxide	15 or 20%	8-10 hrs	Reg, mint or melon
	Opalescence PF	Carbamide Peroxide	15 or 20%	8-10 hrs	Potassium nitrate & Fluoride
Discus Dental	Nite White Excel 2	Carbamide Peroxide	10, 16, or 22%	10%-overnight 16%-4hrs 22%-1hr	Regular or Cherry
	Nite White Excel 3	Carbamide Peroxide	Same	See above	Hydrogen Peroxide 1%
	Day White Excel 2	Hydrogen Peroxide	7.5 or 9.5%	30 min twice daily	
Premier Dental	Perfecta Bravo	Hydrogen Peroxide	9%	30 min once daily	
Densply	Nupro Gold	Carbamide Peroxide	10% or 15% with FI		
Procter & Gamble	Crest White Strips	Hydrogen Peroxide	6.5%	30 min twice daily	3 week supply

Over the Counter Products¹¹

Company	Brand	Type	Percent	Time	Misc.
Procter & Gamble	Crest White Strips	Hydrogen Peroxide	5.3%	30 min 2xday	2 week supply
Colgate-Palmolive	Colgate Simply White	Carbamide Peroxide	18% (6% H ₂ O ₂)	30 sec 2xday	Brush-on gel

Please mark only one **best** answer to the following questions on the one page answer sheet. Return the answers by mailing or faxing the answer sheet or entering your answers on the form available on our website at <http://www.fice.com/>.

This test contains 13 questions. Please mark your answers in spaces numbered 1 through 13 on your answer sheet.

1. The enamel layer of the tooth is...
 - a. translucent
 - b. opaque
 - c. transparent
 - d. none of the above

2. Which of the following can potentially cause intrinsic staining?
 - a. coffee drinking
 - b. smoking
 - c. fluoride ingestion
 - d. red wine drinking

3. Which of the following causes extrinsic staining?
 - a. coffee
 - b. smoking
 - c. tetracycline
 - d. a and b

4. _____ is the main attribute of color that distinguishes it from other colors.
 - a. chroma
 - b. value
 - c. hue
 - d. saturation

5. Which characteristic of color is considered the most important in terms of matching tooth shades?
 - a. chroma
 - b. value
 - c. hue
 - d. saturation

6. Teeth darken for all the following reasons except...
 - a. drinking coffee
 - b. trauma
 - c. fluoride ingestion
 - d. fruxism

7. Whitening toothpastes can whiten teeth as effectively as hydrogen peroxide but it takes longer.
- true
 - false
8. Potential side effects of tooth whitening include.
- nausea
 - gingival inflammation
 - temperature sensitivity
 - enamel erosion
 - b and c
9. A 10% Carbamide Peroxide gel contains roughly what percentage of hydrogen peroxide?
- 1%
 - 3%
 - 5%
 - 20%
10. A light is necessary in order to effectively perform in-office tooth whitening?
- true
 - false
11. Prior to whitening, which of the following should be discussed with the patient?
- expectations
 - protocol
 - risks and complications
 - consent
 - all of the above
12. The most common side effect associated with whitening is...
- gingival irritation
 - throat irritation
 - enamel erosion
 - sensitivity
13. The latest generation of composite resins will lighten along with the tooth during tooth whitening.
- true
 - false

(end of test)

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