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The untold secrets of managing dentinal hypersensitivity

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The untold secrets of managing dentinal hypersensitivity

ABSTRACT

Dentinal hypersensitivity (DH) is a common dental condition that affects a majority of the population, and despite extensive investigation, this disorder remains underdiagnosed, underreported, and undertreated. Dentinal hypersensitivity impacts quality of life and emotional well-being. Patients experiencing DH can also suffer from physical and psychological problems. Clinical management of dentinal hypersensitivity is possible. This article will review the etiology and prevalence of dentinal hypersensitivity while examining causative factors of the condition. Clinical management strategies will be discussed along with current treatment modalities, highlighting effective at-home and in-office therapies.

EDUCATIONAL OBJECTIVES

- Examine the etiology and prevalence of dentinal hypersensitivity
- Recognize contributing factors of dentinal hypersensitivity
- Discuss clinical management of dentinal hypersensitivity
- Describe the latest technological advancements in dentinal hypersensitivity treatment modalities along with their mechanism of action
- Help patients manage dentinal hypersensitivity with home-use products and in-office therapies while providing them with instant and long-term relief from pain

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Is dentinal hypersensitivity (DH) a minor issue affecting a handful of patients? Disappointingly, the answer is no. Dentinal hypersensitivity affects a significant portion of the population and all age groups. Research data reveals 57% of the general population suffers from dentinal hypersensitivity with the frequency considerably higher, 60%-98%, in periodontal patients.[1] Studies suggests dentinal hypersensitivity peaks between the ages of 20-40 with a slightly higher prevalence in women.[2] Despite extensive investigation of DH, this disorder remains underdiagnosed and underreported.[3]

Dentinal hypersensitivity is a common dental condition marked by sudden, short, sharp bursts of pain when affected surfaces are exposed to external stimuli including thermal (hot and cold), tactile (brushing or flossing), osmotic (consumption of acidic, sweet, or sugary foods), and chemical (whitening).[4-6] Dentinal hypersensitivity occurs when external stimuli cause dentinal tubular fluid movement, which activates nerve fibers and causes pain.[2] This phenomenon is also known as the hydrodynamic theory. There have been many hypotheses proposed in understanding pain mechanisms related to DH; however, the most commonly accepted physiological explanation for this clinical disease is the hydrodynamic theory.[2,7,8] Interestingly, in a recent study, Anderson et al. noted that hypersensitive teeth, when compared to nonsensitive teeth, have roughly eight times the number of tubules per unit and wider tubule diameters.[8]

Dentin exposure can be caused by periodontal disease, gingival recession, cracked teeth, erosion, abrasion, abfractions, diet, personal behaviors, and tooth fractures.[2,9] In the mouth, buccal surfaces are at a greater risk for developing dentinal hypersensitivity, with premolars most commonly affected.[10] Pain associated with DH is highly subjective and patients can experience very minor discomfort or be subjected to severe agony.[2] Because there are a host of etiological factors associated with DH, and patients experience a range of discomfort levels, there is no recognized gold standard for treatment.

Dentinal hypersensitivity impacts quality of life and emotional well-being.[5] Sufferers reported displeasure with eating and drinking while some hide the way they eat.[5] Others reported coping mechanisms, which usually involved avoidance techniques including: avoiding brushing or flossing the affected area; avoiding certain foods or drinks or eating altogether; avoiding social gatherings; and avoiding talking or smiling to prevent exposure to cold air.[5]

CLINICAL MANAGEMENT OF DENTINAL HYPERSENSITIVITY

Clinical management of dentinal hypersensitivity is possible. Unfortunately, many patients do not view DH as a dental condition and dismiss it as a simple inconvenience. The first step in clinical management of dentinal hypersensitivity is identifying the cause. By doing so, the clinician is also ruling out other causes of pain, such as caries. Miglani et al. proposed that an often neglected phase of clinical management is removing the causative factors that prevent DH from occurring or reoccurring.[11] These causative factors include improper toothbrushing, poor oral hygiene, malocclusion, periodontal disease, lifestyle, and diet.

The second step in clinical management involves patient education. In order for this stage of care to be effective, the dental health-care practitioner (DHCP) will need to complete a thorough medical, dental, and social history, along with a nutritional assessment. Information from these assessments will help to identify the aforementioned causative factors. DHCPs will need to ensure they dedicate a sufficient amount of time to be able to properly educate their patients. During this time, the clinician is responsible for increasing patient awareness about DH and explaining the correlation between sensitivity and the impact on quality of life.[5] Recognition of the causative agent will allow the clinician to reduce dentinal hypersensitivity by simple methods including diet modification and brushing techniques.[12]

When removal of the causative agent proves to be ineffective, the DHCP should consider treatments that decrease the porousness of dentin, which becomes more permeable over time, such as depolarizing the nerve or occluding the dentinal tubules. These treatments often involve the use of potassium salts, sodium fluoride, strontium chloride, dibasic sodium citrate, formaldehyde, sodium monofluorophosphate, arginine, calcium carbonate, or stannous fluoride.[2,11,12] The ideal desensitizing agent should be fast acting, nonirritating, painless, easy to use, provide long-term effects, and should not stain teeth.[11]

When elimination of contributing factors proves ineffective in providing DH relief, DHCPs should recommend an at-home desensitizing agent. At-home therapies typically involve the use of toothpastes, mouthwashes, and chewing gum, and are the most cost-effective for the patients. The most common ingredient in toothpastes is 5% potassium nitrate. The potassium ions penetrate the tubules and decrease the excitability of the nerve.[13] Incorporating bioglass into toothpaste formulations has shown positive results in the treatment of DH. There is sufficient evidence in the published literature that proves incorporating bioglass into toothpastes occludes dentinal tubules.[1] Bioglass is composed of specific percentages of silicon, sodium, calcium, phosphorus oxides, and on occasion, fluoride. When the bioglass material comes in contact with the saliva, a protective layer of hydroxyapatite is formed over the tooth, mechanically occluding the tubules and decreasing the flow of fluid within the tubules.[1] In addition to potassium nitrate and bioglass, various fluoride solutions have been incorporated into toothpastes and mouth rinses to treat DH, including sodium fluoride, stannous fluoride, sodium monofluorophosphate, fluorosilicates, and fluoride combined with iontophoresis, all of which act to seal the dentinal tubules or form coagulates inside the tubules.[11]

Oxalates can be very effective in treating DH. Oxalates are organic substances found in plants, and they work to treat hypersensitive teeth by blocking the flow of fluid in the dentinal tubules by means of occluding the tubules and reducing the patient's perception of pain to external stimuli.[3,13] Oxalates can be delivered via toothpastes, mouth rinses, and tray systems. Oxalates are particularly unique, because unlike

other compounds that occlude the dentinal tubules, oxalates are insoluble in acids and remain intact when exposed to mechanical challenges such as brushing, dietary acids, and salivation.[3] Altuve et al. reported that research indicated polyethylene strips coated with a 1.5% oxalate gel offered quick and longer-lasting relief for hypersensitive teeth compared to some toothpastes containing potassium nitrate.[3]

There are some prescription strength dentifrices and varnishes that contain amorphous calcium phosphate (ACP), casein phosphopeptide–amorphous calcium phosphate (CPP-ACP), calcium sodium phosphosilicate, and tricalcium phosphate (TCP) that can be used to treat DH. ACP and calcium sodium phosphosilicate help to reduce sensitivity by accelerating remineralization, while CPP-ACP works to partially occlude the dentinal tubules.[2] TCP, the newest member of the calcium phosphate family, decreases sensitivity by enhancing remineralization through the slow release of calcium to the tooth surface.[2]

When recommending a dentifrice or mouthrinse to treat DH, it is important to educate the patient on the proper use of these products to achieve the desired result since the effectiveness of these products relies heavily on patient compliance. Patients can expect to experience relief with these products within two to four weeks, but they must be used consistently. Patient compliance is also a major obstacle with use of these products. It is also worth noting that patients should be cautioned to use a minimal amount of water with these treatment options to prevent dilution of the active agent. The effects of these products are often short lived because of the subsequent exposure of the treated surface to acid attacks, improper brushing methods, and use of other abrasives.[12]

Creams and pastes containing nanohydroxyapatite are proving to be effective for long-term DH relief. The mechanism of action behind these products involves nanoparticles filling superficial enamel lesions and the tiniest irregularities that arise from erosion, thereby restoring the mineral balance to the tooth.[13] These particles also adhere to the tooth structure and protect the tooth against demineralization and erosion.

When at-home desensitizing agents prove to be unsuccessful, patients can benefit from in-office desensitization therapy. In-office treatments typically provide immediate relief and include the use of fluoride (creams, gels, foams, rinses, varnish), oxalates, resin-based dentinal hypersensitivity material, bioglass, Portland cement, and lasers.[5,11,12] It is not uncommon for the DHCP to recommend patients follow up with an at-home desensitizing agent after using in-office therapies to achieve longer-lasting results. Resin-based materials that involve a bonding system should be used as a last resort.[12] Of all the in-office therapies listed, fluoride varnish has become the most commonly used and has proven to be highly effective in reducing dentinal hypersensitivity.

FLUORIDE VARNISH

Fluoride varnish is a concentrated form of sodium fluoride (NaF) suspended in an alcohol and resin-based solution.[9,14] Fluoride varnish was first introduced in Europe in 1964 as a treatment modality for dental caries.[14] Fluoride varnish was originally approved for use in the United States in 1991.[14] Today, the Food and Drug Administration regulates the use of fluoride varnish as a Class II, 510(k) medical device, and it is cleared to be used as a cavity liner and desensitizer.[15] The use of fluoride varnish for caries prevention is considered an off-label use. The American Dental Association endorses the use of fluoride varnish as an anticaries treatment modality. In fact, the American Dental Association Council on Scientific Affairs and the Cochrane Oral Health Group conducted a systematic review of randomized controlled trials and found that, when applied two to four times a year, fluoride varnish has a considerable effect on inhibiting caries formation in primary and permanent dentition in children, adolescents, and high-risk populations.[16]

Varnishes are applied directly to the tooth surface. The resin base allows the varnish to stick to the tooth surface. Colophony is the most common resin additive. It is derived from pine tree sap and is unrelated to pine nuts and does not trigger a nut allergy reaction. This is the agent that allows the varnish to stick to teeth, releasing high concentrations of fluoride over an extended period of time, and gives varnish the sticky feeling.[14] Colophony is also responsible for leaving a film on the tooth surface. The alcohol allows the varnish to dry and set rapidly.[14]

When dental practitioners began to use varnish to treat hypersensitivity, patients were dissatisfied because of taste and also because of the yellowish tint the varnish left on treated surfaces. Also, varnishes dispensed in tubes lacked homogeneity in fluoride concentration because of the aqueous solution inside of the tubes causing the elements to separate. Since their introduction in 1991, fluoride varnish delivery systems and esthetics have advanced.[17]

Currently there is an estimated 49 varnish products on the market. The physical composition of fluoride varnishes is similar. The vast majority of varnishes are composed of 5% NaF, which can also be expressed as 2.26% or 22,600 PPM fluoride ions. Dosage for children six and under is 2.25%. All forms and concentrations of fluoride varnishes are safe when dosing guidelines are followed. All varnishes contain a film-forming agent, such as colophony, a solvent, flavors, sweeteners, and other additives that aid in remineralization such as calcium, casein phosphopeptide, amorphous calcium phosphate, and calcium fluoride.[18]

Solvents impact the viscosity, spreadability, migration, solubility, and fluoride ion release profile of varnishes, thereby impacting their behavior. This behavior is what differentiates varnishes. Varnishes with a high solubility will release fluoride faster than varnishes with limited solubility. Ideally, varnishes should have a lower solubility with a sustained release of fluoride, which increases the contact time on the tooth surface and increases the opportunity for fluoride to be used rather than flooding the oral cavity with fluoride where it can potentially be swallowed or rinsed away.[19] Flavors and sweeteners affect the palatability of varnishes. Spreadability, flowability, and migration refer to how easily the varnish can be applied to

the tooth and spread to other areas of the mouth (proximal and lingual surfaces) before the solution sets. These features prevent the clinician from having to place the varnish in precise areas for effectiveness.[19] Calcium additives are important in varnishes because they affect the bioavailability of fluoride, which ultimately impacts varnish performance.

HOW DOES FLUORIDE VARNISH WORK?

Once varnish is applied to the tooth surface, the fluoride ions are absorbed into the hard tissues. Fluoride acts to inhibit demineralization and enhance remineralization. The fluoride ions stick to areas of the tooth that have been demineralized and integrate with hydroxyapatite.[19] The fluoride ions are also attracted to the calcium and phosphate ions in the saliva. When fluoride combines with calcium and phosphorus, a crystalline structure called fluorapatite is formed.[20] Fluorapatite has a lower solubility profile than hydroxyapatite, which allows the ions to dissociate and become bioavailable at a lower pH.[19,20] Remineralization can occur in the mouth without fluoride, but it is a much slower process; fluoride acts as a catalyst in this process.[19]

Calcium additives in varnishes behave differently. Calcium combines with fluoride to form insoluble globules inside the dentinal tubules.[19] These globules help to provide the greatest hypersensitivity relief inside the tubules over a sustained period of time because the globules located inside of the tubules are not as sensitive to oral changes in pH as globules that are along the gumline.[19]

INDICATIONS FOR FLUORIDE VARNISH

Fluoride varnish is not only indicated for hypersensitivity but is also an effective treatment for inhibiting caries formation, promoting remineralization of the tooth surface, decreasing the rate of demineralization, and dry mouth.[4,6,9] Fluoride varnishes are preferred as an in-office treatment because they are quick and easy to use. Clinicians can simply paint the varnish onto the tooth surface, and with many new formulations, the solution dries within seconds.[4,6,9,19] The varnish sticks to the tooth surface, so the treated area receives a higher concentration of fluoride over a sustained period of time with less chance of systemic ingestion.[9] Fluoride varnishes eliminate the need for trays, making them ideal for young children and gaggers. This is also cost-effective for the office. Fluoride varnishes come in various flavors, which helps increase patient acceptability in infants, toddlers, preschoolers, and children with special needs.

There are some disadvantages associated with the use of fluoride varnish. Some patients have complained about the sticky feeling after the varnish is applied to the tooth surface. Patients have also complained about the yellowish tint, although many new formulations leave a clear finish. Some dental providers have indicated cost as a patient concern. Varnishes are contraindicated for open carious lesions, treatment areas with discoloration concerns, and low-risk or decay-free individuals who live in areas with fluoridated water.[19,21]

HOW TO PICK A VARNISH

With so many varnish products on the market, how do you pick just one? All varnish products work to occlude the dentinal tubules and release fluoride. Fluoride uptake is a key feature for varnishes and helps to determine the effectiveness of the product. Ideally, a fluoride varnish should exhibit fluoride uptake for up to 24 hours after an acid challenge.[19] Below are other clinical features that should be considered when selecting a fluoride varnish:

1. Delivery system: tube versus single-dose unit
2. Ease of application
3. Migration
4. Additives: designed to increase effectiveness
5. Flavor
6. No tooth discoloration
7. Performance: demonstrated by clinical data

Some of the most common varnishes on the market are very similar, in that they aid in the treatment of hypersensitivity, enhance remineralization, and inhibit caries formation. But they are different because of the different additives included in an attempt to increase their effectiveness.[14] Differences include color and the incorporation of Recaldent technology, which is a combination of CPP and ACP.[14] Some varnishes permit a slow release of fluoride over a 24-hour period, while others permit the release of fluoride each time there is an acid attack in the mouth.[14] There are currently advanced varnishes on the market that contain xylitol, which has a proven cariostatic effect and enhances the taste of the varnish. These advanced formulations are also moisture tolerant, so drying of the treatment area is not necessary, making application of this product very efficient.[22] In addition, these varnishes allow patients to experience immediate relief in sensitive areas with a high yield of fluoride on the treated surface.[22]

ADDITIONAL THERAPIES

Strassler et al. reported that the use of 5% glutaraldehyde and 35% hydroxyethylmethacrylate is highly effective in providing DH relief for up to nine months. Although very little research exists to support the use of steroids as a treatment option, using 0.5% or 1% prednisolone on the exposed root surface can provide cessation of sensitivity immediately after application.[1]

First introduced in the 1960s, iontophoresis continues to be used to provide temporary relief from DH. Iontophoresis uses a low galvanic current along with fluoride gels to cause movement of metal ions, thereby producing an electric current, which results in the precipitation of insoluble calcium to occlude open tubules.[1,23] Hypersensitive teeth that have been exposed due to recession and have root surface loss as a result of abrasion, erosion, and/or an abfraction leaving a notching of the root may require the placement of an adhesive composite resin or glass ionomer restoration to cover the exposed surface to provide DH relief or grafting.[1]

Lasers are also an effective in-office therapy used to seal dentinal tubules. The use of the Nd:YAG, Er: YAG, and a He:Ne laser has been found to be successful for providing DH relief.[1,2]

Innovative ORMOCER-based light-curing protective varnish desensitizers

are highly effective in treating DH. They are biocompatible and use special filler technology and fluoride release to provide permanent elimination of hypersensitivity.[24] These products work to eliminate DH through the precipitation of plasma proteins of dentinal fluid inside the tubules, which offers significant reduction of stimulus transfer through intensive deep sealing of the exposed root dentin and reduced fluid flow.[24] Studies show that hypersensitivity relief can be achieved for up to two years with treatments.[24] The special filler technology is designed to provide a highly abrasion-resistant protective layer.[24] In addition to treating hypersensitive root surfaces, this transparent varnish is ideal for desensitizing crown margins, after tooth scaling, and for exposed cervical areas.[25]

CONCLUSION

Clinical management of DH should be based on etiology and severity. As clinicians, it is important that we understand the science behind what we select and offer to our patients. This is the premise behind evidence-based dentistry. Depending on the severity of DH, clinical management may involve both at-home and in-office therapies. It is wise to recommend the most cost-effective treatment as a first line of defense, which is often desensitizing toothpaste.[1]

Management of dentinal hypersensitivity can be accomplished with the use of fluoride varnishes. While varnishes are similar in the mechanism of action, they do not all behave the same because of the additives, solvents, and matrixes incorporated into their formulations. As a clinician, it is critical to have a solid understanding of how a varnish behaves in order to measure effectiveness.[15]

Fluoride varnishes are highly effective in providing relief to patients suffering from sensitivity and offer additional benefits, but should be used according to a patient's risk, not age. The effectiveness of all treatments relies on the delivery system, ingredients, formulation, and patient compliance. Once a tooth becomes hypersensitive, it should be reevaluated at each appointment with an emphasis on prevention of the condition.

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QUESTIONS

1. Dentinal hypersensitivity affects which age group?
A. 13-18
B. 19-50
C. 50 and older
D. All of the above

2. Hypersensitive teeth, when compared to nonsensitive teeth, have roughly how many times the number of tubules per unit?
A. 10
B. 8
C. 4
D. 2

3. The buccal surfaces of which teeth are most commonly affected by dentinal hypersensitivity?
A. Molars
B. Lateral incisors
C. Premolars
D. Canines

4. Coping mechanisms for dentinal hypersensitivity include all of the following except:
A. Brushing the affected area
B. Avoidance of certain foods and drinks
C. Limited social gatherings
D. Less smiling

5. Which of the following factors has been attributed to dentinal hypersensitivity?
A. Improper brushing
B. Malocclusion
C. Diet
D. All of the above

6. The first step in clinical management of dentinal hypersensitivity is:
A. Patient education
B. Recognition of the causative agent
C. Prescribing a dentifrice containing potassium nitrate
D. None of the above

7. Oxalates can be delivered via:
A. Toothpastes
B. Mouth rinses
C. Tray systems
D. All of the above

8. Which calcium phosphate combination enhances remineralization through the slow release of calcium to the tooth surface?
A. CPP-ACP
B. ACP
C. TCP
D. None of the above

9. Which mechanism of action works to help eliminate pain caused by dentinal hypersensitivity?
A. Depolarization of the nerves
B. Occlusion of the dentinal tubules
C. Both A and B
D. None of the above

10. Which governmental agency regulates the use of fluoride?
A. FDA
B. EPA
C. OSHA
D. OSAP

11. In the United States, fluoride is cleared to be used as:
A. A treatment modality for dental caries
B. A cavity liner
C. A desensitizer
D. Both B and C

12. Which of the following agents in traditional varnishes allows the material to stick to the teeth?
A. Flavors
B. Solvents
C. Colophony
D. Alcohol

13. Which varnish additive impacts viscosity, spreadability, migration, and solubility?
A. Flavors
B. Solvents
C. Colophony
D. Alcohol

14. Which varnish additive impacts palatability?
A. Flavors
B. Solvents
C. Colophony
D. Alcohol

15. Once fluoride varnish is applied to the tooth surface, which of the following occurs?
A. Inhibition of demineralization
B. Enhancement of remineralization
C. Integration with hydroxyapatite
D. All of the above

16. Which varnish additive provides the greatest hypersensitivity relief inside the tubules over a sustained period of time?
A. Flavors
B. Solvents
C. Calcium
D. Alcohol

17. Fluoride varnish is indicated for the treatment of which dental condition?
A. Dry mouth
B. Caries
C. Remineralization
D. All of the above

18. Which of the following uses special filler technology and fluoride release to provide permanent elimination of hypersensitivity?
A. Laser
B. 5% glutaraldehyde
C. ORMOCER-based desensitizer
D. Iontophoresis

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QUESTIONS

19. Which in-office desensitization therapy should be used as a last-resort treatment modality?

A. Portland cement
B. Bonding systems
C. Lasers
D. Bioglass

20. Clinical considerations for the selection of a fluoride varnish include:

A. Ease of application
B. Performance
C. Delivery systems
D. All of the above

21. Which phase of clinical management of dentinal hypersensitivity requires the clinician to conduct a thorough medical, dental, and social history?

A. Identification of the cause
B. Elimination of contributing factors
C. Patient education
D. Both A and C

22. Identify the correct statement.

A. Dentinal hypersensitivity impacts quality of life and emotional well-being.
B. The least commonly accepted physiological explanation for dentinal hypersensitivity is the hydrodynamic theory.
C. Dentinal hypersensitivity is widely reported and properly diagnosed.
D. Dentinal hypersensitivity is an uncommon dental condition marked by sudden, short, sharp bursts of pain.

23. Which of the following contributes to dentin exposure?

A. Periodontal disease
B. Abfractions
C. Cracked teeth
D. All of the above

24. All of the following statements are correct except:

A. The effectiveness of at-home desensitization products is independent of patient compliance.
B. At-home desensitization products require a minimal amount of water.
C. The effects of at-home desensitization products are often short lived because of the subsequent exposure of the treated surface to acid attacks.
D. At-home desensitization products must be used consistently to provide relief for users.

25. Which technology contains nanoparticles that act to fill superficial enamel lesions and irregularities that arise from erosion?

A. CPP-ACP
B. Calcium sodium phosphosilicate
C. Nano-hydroxyapatite
D. TCP

26. According to the American Dental Association Council on Scientific Affairs and the Cochrane Oral Health Group, how often should fluoride varnish be applied to provide a considerable effect on inhibiting caries formation in primary and permanent dentition in children, adolescents, and high-risk populations?

A. Once every two years
B. Once a year
C. Two to four times a year
D. Five times a year

27. Which property of fluoride varnishes increases the contact time on the tooth surface and increases the opportunity for fluoride to be used?

A. Spreadability
B. Solubility
C. Viscosity
D. Migration

28. Which property of fluoride varnishes determines how easily the varnish can be applied to the tooth and spread to other areas of the mouth?

A. Spreadability
B. Solubility
C. Flowability
D. Both A and C

29. What therapy would be considered the most cost-effective for patients suffering from dentinal hypersensitivity?

A. Fluoride varnish
B. At-home dentifrice
C. In-office fluoride rinse
D. None of the above

30. The effectiveness of all dentinal hypersensitivity treatments relies on which of the following?

A. Delivery system
B. Ingredients
C. Formulation
D. All of the above

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EXPIRATION DATE:	JULY 2024

ANSWER SHEET

The untold secrets of managing dentinal hypersensitivity

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EDUCATIONAL OBJECTIVES

1. Examine the etiology and prevalence of dentinal hypersensitivity
2. Recognize contributing factors of dentinal hypersensitivity
3. Discuss clinical management of dentinal hypersensitivity
4. Describe the latest technological advancements in dentinal hypersensitivity treatment modalities along with their mechanism of action
5. Help patients manage dentinal hypersensitivity with home-use products and in-office therapies while providing them with instant and long-term relief from pain

COURSE EVALUATION

1. Were the individual course objectives met?

Objective #1: Yes No Objective #2: Yes No Objective #3: Yes No

Objective #4: Yes No Objective #5: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

2. To what extent were the course objectives accomplished overall?	5	4	3	2	1	0
3. Please rate your personal mastery of the course objectives.	5	4	3	2	1	0
4. How would you rate the objectives and educational methods?	5	4	3	2	1	0
5. How do you rate the author's grasp of the topic?	5	4	3	2	1	0
6. Please rate the instructor's effectiveness.	5	4	3	2	1	0
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8. Please rate the usefulness and clinical applicability of this course.	5	4	3	2	1	0
9. Please rate the usefulness of the supplemental webliography.	5	4	3	2	1	0

10. Do you feel that the references were adequate? Yes No

11. Would you participate in a similar program on a different topic? Yes No

12. If any of the continuing education questions were unclear or ambiguous, please list them.

_____

13. Was there any subject matter you found confusing? Please describe.

_____

14. How long did it take you to complete this course?

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15. What additional continuing dental education topics would you like to see?

_____

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8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

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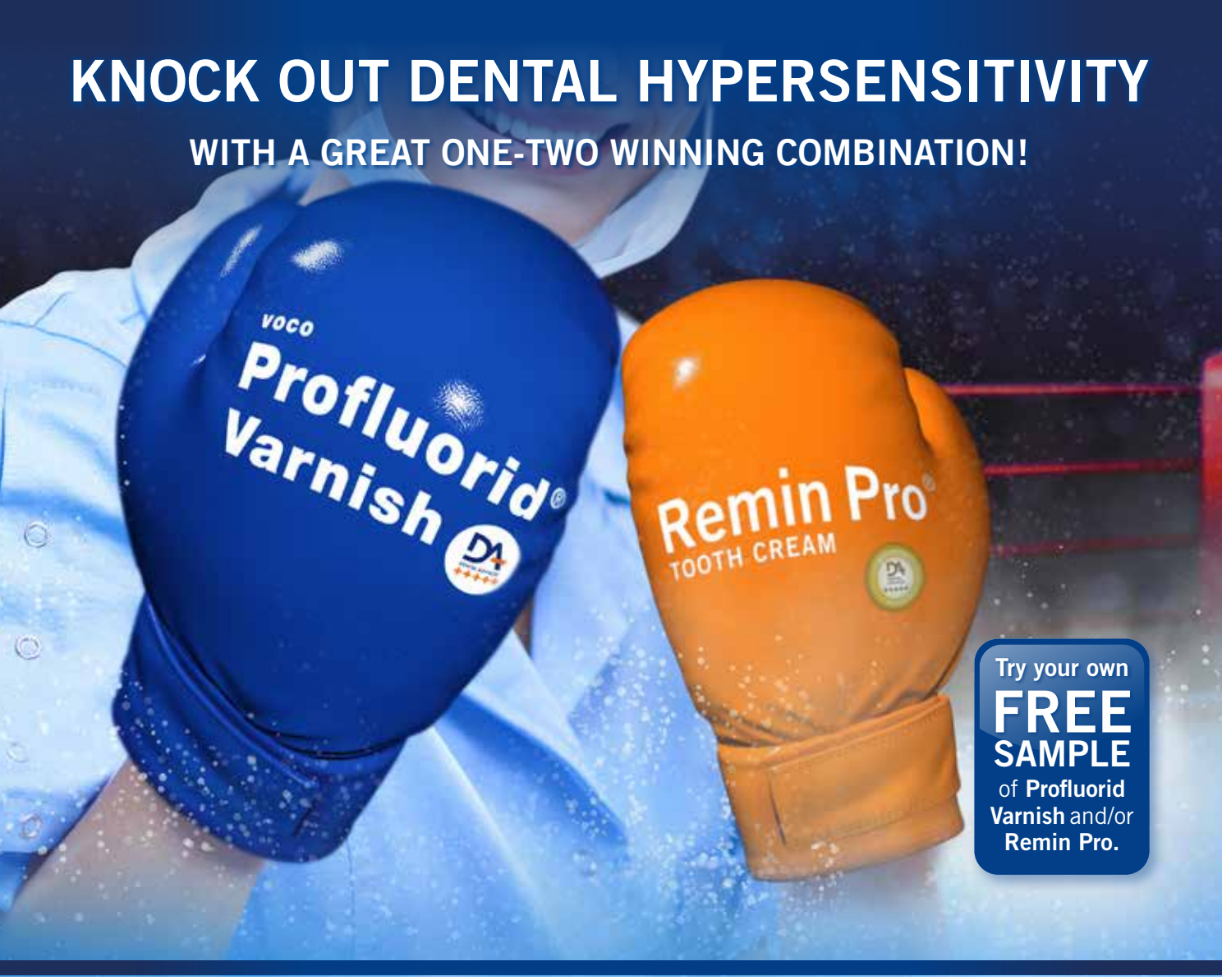

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