

# Giomer Varnish for Prolonged Hypersensitivity Relief

Sam Halabo, DMD

## Introduction

Dentin hypersensitivity, also known as tooth sensitivity, root sensitivity, or just sensitivity, is a common patient complaint in most dental offices.

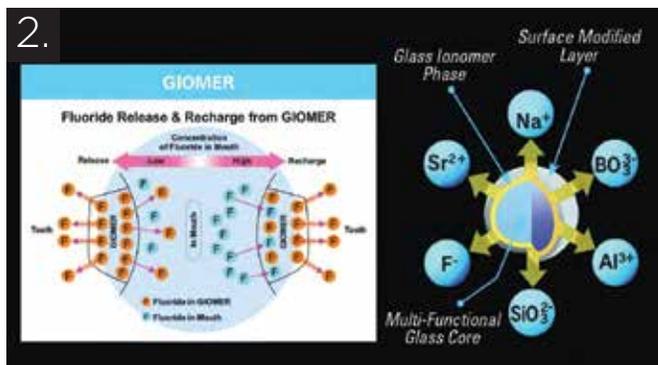
Dentin hypersensitivity is defined as “a brief, severe pain arising from exposed dentin in response to stimuli which cannot be attributed to any other form of dental defect or pathology.”<sup>1</sup> Clinicians see dentin hypersensitivity as a strong response to routine stimuli to the teeth. These stimuli are typically thermal, evaporative, tactile, osmotic or chemical. Dentin hypersensitivity has been referred to as one of the most painful, chronic conditions of the teeth; unfortunately success in treating the condition has been minimal.<sup>2</sup> The pain associated with dentin hypersensitivity affects over 50 percent of the population, yet the majority of sufferers are unaware that the condition can be easily identified and treated.<sup>3</sup> The purpose

of this article is to discuss dentin hypersensitivity and a newer modality of in-office treatment to help patients.

Research reveals that 79 percent of dental professionals believe that dentin hypersensitivity is on the rise. Despite this many dental professionals do not routinely screen patients for the condition, causing it to go undiagnosed. Subsequently, many sufferers may alter their behavior to avoid the pain. Some may avoid certain foods and beverages. Others may neglect their oral hygiene, fail to comply with oral care instructions from their dental professional, or avoid dental visits altogether. Altering their behavior in these ways may increase the risk of other dental complications.<sup>4</sup> Dentin hypersensitivity is typically found in patients whose dentin has become exposed by gingival recession, periodontal therapy, or loss of tooth enamel due to toothbrush abrasion, erosion, or tooth wear. Research also indicates 55 to 75 percent of patients may experience tooth sensitivity during professional whitening treatments.<sup>5</sup>



PRG Barrier Coat.



Giomer technology.



Patient presenting for treatment.



Facial retracted smile view of patient.

### Diagnosis

The diagnosis of dentin hypersensitivity can be very challenging for the dental professional. It is important to conduct a thorough differential diagnosis of the dental pain to exclude other possible causes. These may include: leaking restorations, caries, polymerization shrinkage, pulpitis or fractured teeth. Once a diagnosis has been made and depending on the etiology of the condition, many different treatments may be recommended. In-office and professionally applied treatments are available. Others may prefer professional take-home products that are dispensed at the dental office. And still others may choose to recommend an over-the-counter (OTC) treatment.<sup>6</sup> Regardless of the treatment recommendation that is made, it is important for the clinician to follow up with the patient to evaluate therapeutic results.

### Mechanism

Three major mechanisms of dentin hypersensitivity have been proposed:

- Direct innervation theory
- Odontoblast receptor theory

- Fluid movement/hydrodynamic theory

According to the direct innervation theory, nerve endings penetrate the dentin and extend to the dentinoenamel junction. Direct mechanical stimulation of these nerves will initiate an action potential. There are many shortcomings of this theory, such as a lack of evidence that the outer dentin, which is usually the most sensitive part, is innervated.<sup>7</sup>

The odontoblast receptor theory states that the odontoblasts act as receptors by themselves and relay the signal to a nerve terminal. However, a majority of studies have shown that odontoblasts are matrix-forming cells, and hence they are not considered to be excitable cells. In addition, no synapses have been demonstrated between odontoblasts and nerve terminals.<sup>8</sup>

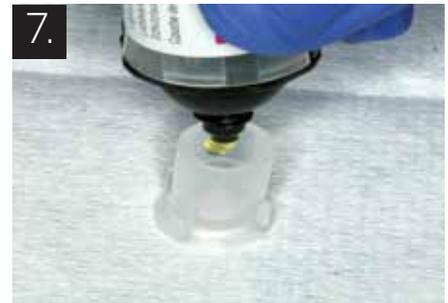
The hydrodynamic theory is based on the presence and movement of fluid inside the dentin tubules. In 1964, Brannstrom proposed that dentin pain is due to hydrodynamic mechanism, i.e., fluid force. The scanning electron microscopic (SEM) analysis of “hypersensitive” dentin shows the presence of widely open dentinal tubules. This centrifugal fluid movement activates the nerve endings at the end of



5. Maxillary retracted arch view of patient.



6. Maxillary right facial quadrant view.



7. One drop of activator is added to the base container.



8. The materials are mixed using a disposable tip.



9. A thin layer of the mixture is applied to the surface of the tooth.



10. The material is light cured.

dentin tubules or at the pulp–dentin complex. It has been noted that stimuli which tend to move the fluid away from the pulp–dentin complex produce more pain. These stimuli include cooling, drying, evaporation, and the application of hypertonic chemical substances. In spite of the fact that fluid movement inside the dentin tubules produces pain, it should be noted that not all exposed dentin is sensitive. “Hypersensitive” dentin has more widely open tubules and a thinner or under-calcified smear layer as compared with “non-sensitive” dentin. Wider tubules will increase the fluid movement and thus the pain response.<sup>9</sup>

Treatment of dentinal hypersensitivity for patients should be developed and implemented by their dental professional. Once diagnosed, patients should be told to avoid the following:

- Using large amounts of dentifrice or reapplying it during brushing
- Using medium or hard bristle toothbrushes
- Brushing teeth immediately after consuming acidic foods or beverages
- Over-brushing with excessive pressure or for an extended period of time
- Excessive flossing or improper use of other interproximal cleaning devices

- “Picking” or scratching at the gum line or using toothpicks inappropriately

Dental professionals should also spend time with their patients reviewing proper home care and brushing techniques, as improper tooth brushing is often associated with dentin hypersensitivity. While it has been suggested that the use of a power toothbrush would be less damaging than a manual brush, it has been shown that both a manual and a power toothbrush used with a desensitizing toothpaste were almost equivalent in effectiveness.<sup>10</sup>

When treating a patient with sensitivity, dental professionals should avoid the following:

- Over-instrumenting the root surfaces during scaling and root planing, particularly in the cervical area of the tooth
- Over-polishing exposed dentin during stain removal
- Violating the biologic width during restoration placement, as this may cause recession
- Burning the gingival tissues during in-office bleaching<sup>11</sup>

### Treatment

There are many ways to treat dentin hypersensitivity. The majority of treatments fall into one of two categories: at-



The uncured layer is removed by gently rubbing the surface with a water moistened cotton ball.



The final result.

home desensitizing agents or in-office treatments. There are currently over twenty in-office desensitizing agents on the market. One very promising in-office treatment is Shofu Dental's PRG Barrier Coat ([www.shofu.com](http://www.shofu.com)) (Figure 1). PRG Barrier Coat effectively treats dentin hypersensitivity by providing immediate and long lasting relief. PRG Barrier Coat is a light-cured varnish with an extended protection time of up to six months. It contains Shofu's proprietary GIOMER technology (Fig. 2) with "surface pre-reacted glass," which provides high fluoride release and recharge, acid neutralization, and anti-plaque benefits. This material can be placed in hard to brush areas, high caries risk areas, and other areas where sensitivity has been reported.

The surface-partially reacted glass (S-PRG) filler particle is a bioactive, tri-laminar structure with a multifunctional glass core embedded in a resin matrix. It is available in various Shofu products. The S-PRG fillers have been shown to release six different ions, including fluoride from the glass core. Additionally, the material can be recharged with fluoride to help with remineralization and protection of the dentition in a manner similar to glass ionomer materials. This release of ions from giomers has also been shown to neutralize the acidity of the oral cavity and contributes to the creation of an anti-plaque effect in areas adjacent to giomer restorations.

### Case Study

The patient, a 54 year-old female, presented for a recall hygiene visit (Figs. 3, 4 & 5). During her examination, the patient stated her frustration with cold sensitivity and her inability to use home desensitizers due to her work schedule as a flight attendant. A number of areas revealed the need for treatment. A discussion took place with the patient regarding treatment options for the teeth noted. The maxillary right

quadrant (Fig. 6) would be treated with PRG Barrier Coat and evaluated at 1, 3 and 6 month intervals.

Prior to treatment, the area was isolated using DryShield ([www.dryshield.com](http://www.dryshield.com)) which allows for retraction of the tongue and cheek as well as high-speed evacuation. The teeth surfaces were cleaned, rinsed, and dried thoroughly. Since anesthetic was not used, the teeth were dried with cotton pellets to ensure comfort.

A container with PRG Barrier Coat BASE was pulled from the package and one drop of PRG Barrier Coat ACTIVE was added to it (Fig. 7). The materials were mixed using the disposable tip provided in the kit (Fig. 8). Once mixed there were two minutes of working-time as the material became more viscous over time. A thin layer of the mixture was applied to the surface of the tooth and left undisturbed for at least three seconds (Fig. 9). The material was light cured (Fig. 10) using a light-curing unit (Halogen light with irradiation of 400-500 nm with intensity > 500mW/cm<sup>2</sup> for 10 seconds or LED at 440-490 nm with intensity > 1000 mW/cm<sup>2</sup> or Plasma arc at 400-500 nm with intensity > 1000 mW/cm<sup>2</sup>). After light-curing, the uncured layer was removed by gently rubbing the surface with a water moistened cotton ball (Fig. 11). The patient was instructed to refrain from consuming any staining food and drink for three days after treatment. The coating layer of this product will be gradually worn by daily tooth brushing and eventually disappear from the tooth surface.

The final result was simple, effective and fast (Fig. 12). The patient was seen at 4, 12 and 24 weeks after treatment and reported no sensitivity. The techniques and materials used in this case allowed for conservative treatment while delivering an effective result for the patient.

### Discussion and Conclusion

There are many different treatment options for patients with dentin hypersensitivity. With so many options available, patients should no longer be suffering from this very treatable condition. Dental professionals need to start asking more questions and screening patients regularly for hypersensitivity, confirming the diagnosis and ruling out other possible etiologies.

The case presented in this article is a common and challenging predicament that clinicians face daily in their practices. The availability of reliable products that allow dental professionals to be conservative and to achieve treatment success can only enhance our profession. Our ability to heal pain and discomfort will allow our patients to be happier and more confident in our treatment plans. **OH**

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Oral Health welcomes this original article.

### References:

1. Dababneh RH, Khouri AT, Addy M. Dentine hypersensitivity—an enigma? A review of terminology, mechanisms, aetiology and management. *Brit Dent J*. 1999;18(11): 606-611.
2. Silverman G, Berman E, Hanna CB, et al. Assessing the efficacy of three dentifrices in the treatment of dentinal hypersensitivity. *J Am Dent Assoc*. 1996;127(2):191-201.
3. Addy M. Dentine Hypersensitivity. New perspectives on an old problem. *Int Dent J* (2002) 52; 367-375.
4. Schiff T et al. *Am J Dent* 2009; 22(Spec Iss A): 8A
5. Van Haywood B. Dentine hypersensitivity: bleaching and restorative considerations for successful management. *International Dental Journal* (2002) 52, 376–384.
6. Orchardson R, Gillam GC. Managing dentin hypersensitivity. *J Am Dent Assoc*. 2006; 137(7):990-998.
7. Irvine JH. Root surface sensitivity: A review of aetiology and management. *J N Z Soc Periodontol*. 1988;66:15–8. [PubMed]
8. Pashley DH. Dynamics of the pulpo-dentinal complex. *Crit Rev Oral Biol Med*. 1996;7:104–33. [PubMed]
9. Chidchuangchai W, Vongsavan N, Matthews B. Sensory transduction mechanisms responsible for pain caused by cold stimulation of dentine in man. *Arch Oral Biol*. 2007;52:154–60. [PubMed]
10. Drisko CH. Dentine hypersensitivity—dental hygiene and periodontal considerations. *Int Dent J*. 2002;52(4): 385-393.
11. Sengupta K, Lawrence HP, Limeback H, Matear D. Comparison of power and manual toothbrushes in dentine sensitivity. *J Dent Res* (Special Issue A). 2005;84: Abstract no. 942

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# PRG Barrier Coat

PRG Barrier Coat is a light-cured, bioactive, resin based varnish formulated for prolonged desensitization of dentinal tubules incorporating Giomer technology.

- Blocks and protects from external irritants for up to 6 months
- Fluoride release and recharge ability
- Excellent self-adhesive properties allows thin coating on flat and slanted surfaces (15um) – aesthetic results
- Acid neutralization and anti-plaque effect
- Simple and quick procedure
- HEMA-free, Acetone-free, and Alcohol-free
- Indicated for a variety of applications - orthodontic brackets, hard to brush areas, exposed root surface, newly erupted molars, white spots and areas of hypersensitivity

Visit [www.shofu.com](http://www.shofu.com) or call **800.827.4638**

MULTIPLE USES



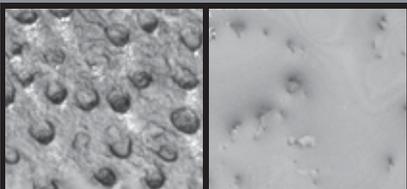
Areas around orthodontic brackets



Hard to brush areas

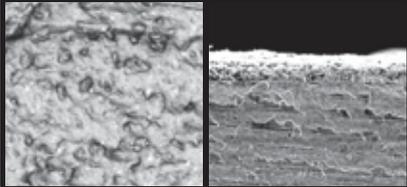


Exposed root surface



Open dentin tubules—before application

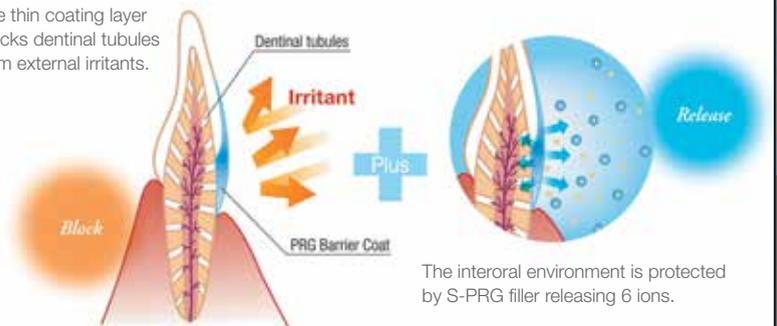
Sealed after PRG Barrier Coat application



Dentin tubules remain sealed after brushing the tooth 2000 times

The thin layer has no effects to aesthetics

The thin coating layer blocks dentinal tubules from external irritants.



The internal environment is protected by S-PRG filler releasing 6 ions.



#### Order Information

- Part Number 1786
- 8 Base units, .02mL ea.
- 1 Active, .09mL
- 8 Brushes

\*Up to 12 teeth per patient application



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## Hypersensitivity Relief