The efficacy of three desensitizing agents used to treat dentin hypersensitivity

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Dentin hypersensitivity (DH) is a common clinical condition that is experienced by 10 to 20 percent of the general population.[1] The Canadian Advisory Board on Dentin Hypersensitivity has defined DH as a sharp, but transient pain arising from exposed dentin in response to thermal, osmotic, tactile or chemical stimuli that cannot be attributed clearly to any other type of defect.[2]

There are various etiologic and predisposing factors for DH. Dentin sensitivity may arise as a result of enamel loss, root surface denudation of the underlying dentin or both. Enamel loss may result from abfraction, abrasion, erosion or stripping of the root surface caused by gingival recession or periodontal treatment.

Several theories have been introduced to characterize DH, and the hydrodynamic theory proposed by Brännström[3] is the most widely accepted. According to this theory, either an inward or outward move-

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ABSTRACT

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Background. In a single-center, double-masked, split-mouth–designed, clinical short-term trial, the authors assessed the clinical responses of teeth with dentin hypersensitivity (DH) after treating the teeth with one of three desensitizing agents across four weeks.

Methods. The authors selected 131 teeth with DH in 11 participants. The authors assessed DH of the teeth by using tactile stimuli and air stimuli and had the participants record the level of sensitivity by means of a visual analog scale (VAS). The authors then treated the teeth with one of three desensitizing agents (Pain-Free [Parkell, Edgewood, N.Y.], BisBlock [Bisco, Schaumburg, Ill.], Seal & Protect [Dentsply DeTrey, Konstanz, Germany]) that they applied according to the manufacturers' instructions. The authors used a split-mouth–designed study in which the teeth in different quadrants of the participants' mouths received different desensitizing agents. The authors also conducted DH evaluations at 10 minutes after treatment and at one, two, three and four weeks. The authors analyzed data statistically by using Mann-Whitney *U* and Kruskal-Wallis tests.

Results. The results of the statistical analysis showed that all VAS scores at the posttreatment evaluation periods were reduced significantly compared with those at baseline ($P < .05$). More teeth were sensitive to air stimuli than to tactile stimuli. The mean VAS scores for DH in the mandibular teeth were significantly higher than for those in maxillary teeth immediately after treatment (for tactile stimuli) and two weeks after the first application (for air stimuli) ($P < .05$)

Conclusions. All three desensitizing agents were effective in relieving DH up to four weeks, independent of their application procedures. There was, however, a significant reduction in mean sensitivity scores of teeth that had been treated with Seal & Protect and Pain-Free compared with those of BisBlock at weeks two, three and four.

Clinical Implications. The study results should be considered with caution, as it is not clear how many of the pain relief effects were related to the natural desensitization of teeth over time.

Key Words. Dentin hypersensitivity; desensitizing agents; visual analog scale.
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ment of fluid within the dentin tubules is responsible for the stimulation of receptors in the pulpal dentinal area, resulting in the generation of pain impulses. The flow of dentinal fluid is affected by the configuration of tubules, the tubule diameter and the number of open tubules.[4]

Evaluating a patient's response to stimulation is a critical part of quantifying his or her oral sensitivity. To help manage DH successfully, patients can record their subjective responses to stimuli such as a cold air blast or a probe on a visual analog scale (VAS), and then practitioners can categorize the patient' sensitivity as slight, moderate, or prolonged or severe.[5]

The goal of treating DH is the immediate and permanent cessation of pain. Treatment can be office- or home-based according to the practitioner's and the patient's delivery and therapeutic aims. The therapeutic aims of office- and home-based treatments are to interrupt the pulpal neural response or to block the sensitive mechanisms through tubule occlusion. Many treatments to occlude dentin tubules and reduce the level of DH have been proposed.[5-8] Clinical studies have been conducted to determine the treatment material that should be used and the most effective treatment method.[5,7-11] However, varying results were reported, which were attributed to different results obtained from the placebo groups and patients' progressively improved oral hygiene habits owing to the Hawthorne effect.[7,8]

The goal of treating dentin hypersensitivity is the immediate and permanent cessation of pain.

Tubule-blocking agents—including fluoride solution, oxalate-containing resin and resin-based desensitizers precipitating protein—have been introduced as dentin desensitizers.[9,12-14] The use of adhesive materials is another method that can be used to seal dentin tubules and reduce dentin sensitivity. The results of clinical studies have shown significant reductions in sensitivity after dentin adhesives have been used.[15-17] The results of in vivo studies have confirmed the efficacy of oxalate- and resin-based treatments.[5,9,14,18-21]

We conducted a study to assess the efficacy of two oxalate-based desensitizing agents and a 2-hydroxyethyl methacrylate– (HEMA-) free desensitizing agent containing fluoride to provide short-term pain relief for DH and to help clinicians choose the most effective and rapid treatment solution for DH. The null hypothesis we tested was that all desensitizing agents would reduce DH by the end of a four-week evaluation period, regardless of the material used and its application procedure.

PARTICIPANTS, METHODS AND MATERIALS

Participants. We recruited 11 participants who responded positively to intraoral testing for DH in the Department of Operative Dentistry, Faculty of Dentistry, Istanbul University, for a single-center, double-masked trial using a split-mouth–designed study. Our other inclusion criteria were that the participants be in good general health, be at least 20 years old and have at least three teeth in three different quadrants of their mouths that were sensitive to tactile or air stimuli with a score of at least two assessed by means of a VAS (as described below).

We excluded patients from the study if they met any of the following criteria: had a known allergy to any of the ingredients in the treatment materials used, were receiving periodontal therapy or had received nonsurgical periodontal treatment within the previous three months, were receiving anti-inflammatory or tricyclic antidepressant agents and analgesic medication, had received antibiotic therapy within the last six months, were pregnant or lactating, had dentures, had any active cervical caries or deep abrasions requiring Class V fillings, or had any fractured or endodontically treated teeth or teeth with large restorations.

We provided participants with detailed information, both orally and in written form, about the principles of treatment and purpose of the study. We also informed the participants about the possible causes and the multifactorial origin of DH and asked them to contact to the lead researcher (U.E.) if they experienced any adverse reactions to the treatment. All of the participants received and signed the appropriate informed consent forms. The Ethical Committee of Istanbul University, Faculty of Medicine, approved the study protocol (project 2007/795).

Treatment procedure. We cleaned 131 sensitive teeth in the 11 participants (one to six teeth

ABBREVIATION KEY. DH: Dentin hypersensitivity. **HEMA:** 2-hydroxyethyl methacrylate. **IAT:** Immediately after treatment.