

Original Article

## Effect of Three Common Desensitizers in Reduction of the Dentin Hypersensitivity after Periodontal Surgery

Salahi S<sup>a</sup>, Ghanbari M<sup>b</sup>, Moosaali F<sup>a</sup>

<sup>a</sup>Oral and Dental Diseases Research Center AND Kerman Social Determinants on Oral Health Research Center AND Department of Periodontics, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran

<sup>b</sup>General practitioner, Faculty of Dentistry, Kerman University of Medical Sciences, Kerman, Iran.

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#### Corresponding Author:

Fereshteh Moosaali,

Department of Periodontics,

Faculty of Dentistry, Kerman

University of Medical

Sciences, Kerman, Iran.

Tel: 09133454495

Email: [moosaaly@kmu.ac.ir](mailto:moosaaly@kmu.ac.ir)

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### Abstract

**Statement of Problem:** Dentin hypersensitivity is one of the most common complaints of patients after periodontal treatments which occur after tissue shrinkage.

**Objectives:** The aim of this study was to determine and compare the effectiveness of sensikin gel (10% potassium nitrate and 0.22% sodium fluoride) with sodium fluoride gel (2.7%) and fluoride varnish (5%) in reducing the dentin hypersensitivity after periodontal surgery.

**Materials and Methods:** Twenty-two patients who, after full mouth periodontal surgery, had a complaint of dentin hypersensitivity (DH) in at least three quadrants were selected. Then a specific treatment was randomly selected for each quadrant which was applied once a day for one week and then stopped. A visual analog scale (VAS) was used to assess the subjects' responses to air blast and periodontal probe stimuli at baseline at one week, and one, three and 6 months after treatment. To analyze the data, repeated measures ANOVA test, Tukey test and variance analysis test were used.

**Results:** At all given intervals, almost both sodium fluoride and sensikin gel significantly reduced the dental sensitivity caused by stimulants. There were no significant differences between sensikin gel and other two desensitizers in reducing the dentin hypersensitivity after 1 week, 1 month, 3 months, and 6 months with respect to air blast stimuli. Sensikin gel was more efficient than Fluoride varnish in reducing the sensitivity caused by periodontal probe after 1 month.

**Conclusions:** Sensikin gel, sodium fluoride gel and fluoride varnish can all be prescribed to reduce dental sensitivity in patients who have undergone periodontal treatments. In the case of severe sensitivity to mechanical stimulations, a treatment with a long-run effectiveness such as sensikin and/or sodium fluoride gel is preferred.

## Introduction

Dentin hypersensitivity (DH) is a common oral health problem which can be developed due to pulpal inflammation and/or tissue shrinkage subsequent to periodontal surgery. It can also be developed by some common factors like removal of the enamel (as a result of attrition, abrasion and erosion), denudation of the root surface (by loss of the overlying cementum and periodontal tissues), or gingival recession (because of severe tooth brushing, pocket reduction surgery, excessive flossing or secondary to periodontal diseases).

It is associated with severe and persistent pain from the exposed dentin, in response to chemical (i.e. exogenous/endogenous non-bacterial acids, carbohydrate/hypertonic chemical substances), thermal (i.e. heat, cooling), evaporative, tactile (i.e. rubbing the sensitive area with a finger nail or toothbrush bristles) or osmotic stimuli which cannot be ascribed to any other form of dental defect or disease [1-6]. The most common form of the treatment of dentine hypersensitivity is the use of desensitizing agents; the tolerance of pain can vary substantially among different people, and even in the same person depending on time and circumstances, since the perception of pain depends on individual factors such as personality, psychological factors and educational level, so this may cause only partial pain relief in most cases [7-10].

Both the numbers of dentinal tubules per unit area and the tubule diameters in the hypersensitive teeth are significantly greater compared with non-sensitive teeth [11]. There are many studies in the literature related to dentin hypersensitivity. Plagmann *et al.* [12] in a study covering 8 weeks of product use by 115 subjects, by the use of tactile stimulus (Yeaple probe) and air blast test for quantifying the dentinal hypersensitivity with the aid of visual analogue scale (VAS) demonstrated that the use of 1400 ppm fluoride dentifrice, delivered either as amine fluoride or sodium fluoride, did not differ significantly with the placebo dentifrice.

Brahmbhatt *et al.* [5] assessed the pain response on a VAS, by using tactile, air blast and cold-water stimuli up to 3-month intervals. It was concluded that all treatment modalities were superior to placebo in reducing DH, as well as 2% NaF-iontophoresis and

HEMA-G were more effective than 2% NaF local application at all-time intervals. But at 3-months, 2% NaF-iontophoresis was more effective than HEMA-G, while placebo produced no significant effect in reduction of DH.

In a randomized clinical trial by Frechoso *et al.* [10], the immediate efficacy of two treatments was compared with bioadhesive gels with different concentrations of potassium nitrate (NK 5% versus NK 10%) on DH by the use of the evaporative stimulus (ES). The researchers indicated a greater reduction of DH after ES during 48 h of treatment when they compared the NK10% group with the NK 5% group and placebo group. This difference increased significantly at 96 h. They also supported the practicality of an NK 10% gel to reduce the DH after stimulation with a blast of air during the first 4 days of its appearance.

Wara-aswapat *et al.* [13] in a 12-week home study investigated the effect of new toothpaste (0.3% triclosan), a desensitizing agent (5% potassium nitrate) and an anticaries agent (0.76% sodium monofluorophosphate (SMFP)) on the gingival health, plaque formation and DH. They reported a significant difference between the three treatment groups for DH. The reductions in VAS sensitivity scores, for the test group and the control group for both the tactile and air stimuli were significantly greater than the benchmark group. The sensitivity score for air stimulus from baseline to week 4 in the test group decreased more rapidly while no overall differences were found between the test and the control groups.

Camilotti *et al.* [14] in 2012 differentiated the effectiveness of different desensitizing agents in the treatment of painful symptoms caused by cervical dentin hypersensitivity (CDH) using modified U.S. Public Health Service criteria. 252 teeth of 42 patients presenting with dentin sensitivity to thermal changes in the oral environment were distributed among seven groups: G1 – placebo; G2, G3, G4 and G6 – fluoride varnishes (FV); G5 – sodium fluoride (SF); and G7 – potassium oxalate. It was found out that after the second week, there were statistically significant differences for all materials compared with the baseline, while after 30 days a significant gradual reduction was seen in Group G7 along with all the evaluated time intervals. They concluded that all the materials can reduce DH, with the exception of

the G1 and G5 group.

As there is no specific study on the impact of materials used in this study on reducing DH after periodontal surgery, the aim of this study was to determine and compare the effectiveness of sensikin gel with sodium fluoride gel and fluoride varnish in reducing the dentin hypersensitivity after periodontal surgery.

### Materials and Methods

This study was a randomized, split-mouth, single-blind clinical trial, involving 22 patients of both sexes (15 female and 7 male, aged between 23 to 66 years with a mean age of 48.2 years) with the complaint of dentin hypersensitivity in at least three quadrants after full mouth periodontal surgery. The number of patients was selected according to related literature [5,15-18]. The study was approved by the Ethics Committee of Kerman University of Medical Sciences (IR.KMU.REC.1394.252). Convenience sampling was performed for enrolling the patients in the study. After describing the study protocol (the characteristics and the conditions of the research) to all participating subjects, an informed consent was taken from the patients and all the patients' information was kept confidential. All of the patients were allowed to leave the study at any time they decided. The inclusion criteria were as follows:

Signing the informed consent, patients of either gender over 18 years of age, tooth brushing with Bass technique, and having at least 3 teeth (either canines or premolars) with an exposed root surface from which a painful response could be elicited by both a dental explorer and air blast [6,10].

The exclusion criteria were as follows:

The use of analgesic medications or desensitizing materials during the previous 6 weeks; any smoking habits; pregnancy or lactation; a history of long-term use of analgesic medications, antibiotic, antimicrobial, antidepressant, antiepileptic, or anti-inflammatory drugs as well as antihypertensive agents; specific oral allergy to any of the desensitizing materials to be evaluated; eating disorders; chronic systemic diseases; the use of orthodontic appliances within the last 3 months [10,13,19]; previous history of hypersensitivity reactions; the presence of large

or defective restorations, cracked enamel, caries, or occlusal overload on the hypersensitive tooth [4,5,6].

At the first visit, demonstration of proper brushing using Bass technique was given to each subject with the help of clinician. Afterwards, they were given a common soft-bristled toothbrush (Oral-B, 3 effects, soft, P&G south African trading) and toothpaste (Crest-complete, Procter & Gamble GmbH, Gross Gerau, Germany). All the patients received non-surgical therapy for pocket elimination with the slurry of a mildly abrasive prophylaxis paste (Golchay, Iran). Afterwards, before the initiation of the study, all subjects have had identical or nearly identical primary clinical conditions such as mouth hygiene, gingival health and etcetera.

The mechanical examination is done by blasting air from a dental instrument at a distance of approximately 2 mm for 3 seconds onto the sensitive area, or gentle scratching (vertically and laterally over the exposed surface) with a dental probe (Yeaple probe) and measured using Visual Analogue Scale (VAS) to determine the most sensitive tooth in each quadrant [4,15,19]. If this provokes a positive pain response and other pathologies can be excluded, DHS therapy should be initiated. In any case, when the discomfort became intolerable, the stimulus was immediately removed. The test stimuli were applied in the same order during the study, with 10-minute interval between the applications of different stimuli. During the test, all the other teeth were isolated by cotton rolls and the desired tooth dried by air. We used two scales (one for air, another for periodontal probe) for every tooth examined at each visit.

A VAS is a horizontal line, 100 mm in length, anchored by word descriptors at each end, as illustrated in Figure 1. The patients specified their perception of pain by drawing a point on the VAS. The distance from this point to the left hand end of the line was VAS score [1,19]. Then three quadrants were selected randomly and the specific treatment regime was considered for each of them.



**Figure 1:** Visual analogue scale

In this stage, the patients who demonstrated at

**Table 1:** Comparison of VAS scores recorded for 2 different stimuli for all the three groups (SG, SF, and FV)

	Air blast				Periodontal probe			
	SG	SF	FV	<i>p</i> value	SG	SF	FV	<i>p</i> value
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$		$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	
Baseline	6.90 ± 2.87	6.45 ± 2.50	6.95 ± 2.49	0.78	4.31 ± 3.38	3.77 ± 2.99	3.86 ± 2.79	0.82
1 week	4.20 ± 2.74	5.90 ± 2.57	4.55 ± 2.52	0.10	2.45 ± 2.92	2.00 ± 2.69	1.55 ± 1.87	0.53
1 month	3.38 ± 2.72	2.71 ± 2.72	3.25 ± 2.95	0.71	2.09 ± 2.64	1.90 ± 2.23	0.47 ± 0.98	0.028*
3 month	3.78 ± 3.08	4.0 ± 2.82	5.15 ± 2.69	0.29	1.68 ± 1.85	2.88 ± 3.28	1.00 ± 2.05	0.72
6 month	3.88 ± 2.08	3.12 ± 3.11	5.68 ± 2.62	0.017*	1.00 ± 1.79	1.21 ± 1.96	0.63 ± 1.38	0.58

least 3 hypersensitive teeth in each quadrant were included and treated every day for a period of one week by the clinician. The treatment protocol was carried out with the three substances: material No.1 (sodium fluoride gel 2.7%, pascal, USA), material No.2 (sensikin gel, 10% potassium nitrate and 0.22% sodium fluoride, laboratorieskin, Spain), and material No.3 (fluoride varnish 5%, Pascal, USA).

Each one of the three studied materials was randomly used for the treatment of the hypersensitive teeth in one quadrant according to the lottery method. The materials were randomly numbered 1 to 3 and each quadrant of the patient (A-up and right, B-up and left, C-down and right and D-down and left) was assigned a unique label. Each label was placed in a bowl and mixed thoroughly. Then three of the labeled tags were picked from the bowl by a blindfolded person. All the quadrants bearing the labels picked

by the researcher were investigated. Afterwards, the treatment was done as follows: The first selected quadrant by the material No.1, the secondary selected quadrant by the material No.2 and the 3rd selected quadrant by the material No.3. Eating and drinking was prohibited immediately after the treatment to half an hour post-treatment.

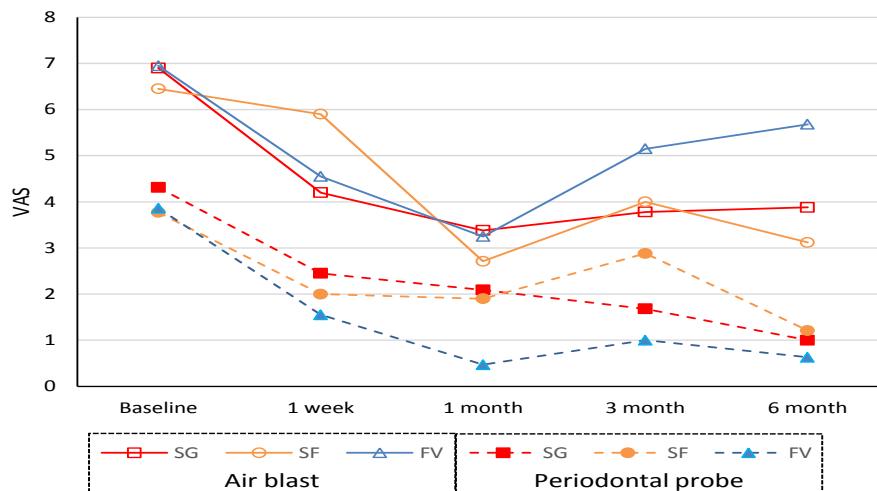
After 1 week, 1 month, 3 months, and 6 months, the patients were called again and the rate of sensitivity of the treated teeth was re-measured and recorded. To analyze the data, repeated measures ANOVA test, Tukey test and variance analysis test were used.

## Results

The statistical analysis revealed no significant differences between the pretreatment groups (Table 1-2).

**Table 2:** The *p* value in the 3 groups at different time intervals versus baseline

	Air blast			Periodontal probe		
	FV	SF	SG	FV	SF	SG
1 week	0	0	0.06	0.01	0.06	0
1 month	0.03	0.01	0.04	0.76	0.03	0
3 month	0.46	0	0.09	0.14	0.01	0.02
6 month	0.02	0.01	0.05	0.3	0.01	0



**Figure 2:** Comparison of VAS scores at baseline, 1st week, 1st month and 3rd and 6th months with two types of stimulus

Sensikin gel after 1 and 6 months and FV at the 1st week, 1st month and 6th month compared to pretreatment significantly reduced the amount of tooth sensitivity to stimulation caused by air blast while the reduction was almost significant at the ( $p \leq 0.05$ ) level at 1 week and at 3 months ( $p = 0.06$  and  $p = 0.09$ , respectively). Moreover, it reduced the dentin hypersensitivity to periodontal probe stimuli ( $p < 0.05$ ) at all-time intervals compared to the baseline (Figure 2). Regardless of the 1<sup>st</sup> week after periodontal probe stimuli, SF significantly reduced the dentin hypersensitivity to various stimuli ( $p < 0.05$ ) at all-time intervals compared to the baseline.

As shown in Table 3, SF with respect to air blast and SG with respect to the periodontal probe

exhibited a greater reduction in DH than FV at 6 months and 1 month, respectively. However, SG was almost significantly more effective than FV in this time period. At all other time intervals, no significant difference was seen between the three groups in all testing parameters ( $p > 0.05$ ). Mean VAS scores in the SF group always were lower for the air stimulus than for the probe stimulus, but it was the opposite for the SG group (Table 1).

Among the patients with complaint of dentin hypersensitivity to a variety of stimuli such as thermal, evaporative, tactile, osmotic, or chemical, the patients' chief complaint (18.2%) was sensitivity to cold and biting pain. The most hypersensitivity was related to the mandibular right lateral (10.6%),

**Table 3:** The significance of pairwise comparative efficacy of the materials used for treatment of dentin hypersensitivity

	Air blast			Periodontal probe		
	SF VS. FV	SG VS. FV	SG VS. SF	SF VS. FV	SG VS. FV	SG VS. SF
Baseline	0.80	0.99	0.83	0.99	0.87	0.82
1 week	0.24	0.90	0.10	0.84	0.50	0.84
1 month	0.81	0.98	0.72	0.074**	0.037*	0.95
3 month	0.43	0.31	0.97	0.06**	0.67	0.30
6 month	0.017*	0.10**	0.68	0.56	0.79	0.92

\* $p$  value  $< pp$  0.05 is statistically significant.

\*\* $p$  value between 0.05 and 0.1 was considered statistically almost significant.

mandibular left canine (9.1%) and the mandibular right second premolar (7.6%), respectively.

## Discussion

Dentin hypersensitivity is a common oral pain arising from the exposed dentine in response to an array of stimuli (i.e. mechanical, tactile, osmotic, or chemical), which cannot be ascribed to any other pathology like necrotizing ulcerative gingivitis, periodontitis, and traumatic tooth picking [16,20-21].

Of those complaining about hypersensitive teeth, 31.8 percent were male and 68.2 percent were female; this may indicate that DH is commonest in females. This finding is in agreement with previous reports published by others [4,10,22-24]. This may be because of bad tooth brushing habits such as using hard brushes, excessive forces and scrubbing at the cervical areas in the females.

Abed *et al.* [15] clinically evaluated the efficacy of Neodymium-Doped Yttrium Aluminum Garnet (Nd:YAG) Laser Therapy and Sensikin gel in treatment of DH. They used VAS to quantify sensitivity by the cold air syringe. They found that in Sensikin gel treated group, the amount of VAS index significantly reduced at 1 week, 1, 3 and 6 months after application compared with the baseline. Table 2 shows that this finding is almost in line with our findings. Potassium nitrate and sodium fluoride are some active ingredients of Sensikin gel, individual efficacy of which has been shown in the study of Ritter *et al.* In the SG group, 1 week and 3 months after the application of VAS index, when tested with air blast and periodontal probe, it almost differed significantly but it differed significantly from the baseline, respectively. Unlike SF, Sensikin gel was not exactly significantly different at all-time intervals when tested with air blast.

Ritter AV. *et al.* found that the teeth desensitized with the FV had significantly lower mean VAS scores when tested with air blast at 8 and 24 weeks post-treatment in comparison with baseline scores [17]. In this study, we found that in the FV treated group, the amount of VAS index significantly reduced when tested with air blast at 1 week, 1 and 6 months while it only significantly reduced when tested with periodontal probe at 1 week after application

compared with the baseline.

Fluoride varnishes are theoretically ideal desensitizing agents for several reasons. Importantly, they are inexpensive, convenient to use in the office, as well as quick and easy in application. The varnish is reported to set on the teeth in the presence of the saliva, so it is unnecessary although advisable to thoroughly dry all tooth surfaces prior to treatment, the varnish stays on the teeth for hours and in some instances for days that causes immediate relief and is the primary cause of the high levels of fluoride uptake [18].

Within the limitations of this study, such as lack of control group, the 3 groups presented improvements in DH as expressed by the comparison between the initial and final means obtained during and after the treatment. When groups FV, SG and SF were compared at 1 month, SG was significantly more effective than FV and SF was almost significantly more effective than FV for the probe stimulus while at 6 months SF was significantly superior to FV and SG was almost significantly superior to FV for the air stimulus. At other time intervals, there were no statistically significant differences between the 3 groups. This made it possible to establish which of the materials were clinically effective. These outcomes are in line with those of other studies that reported a similar action for different fluoridated products used in the treatment of DH after a few weeks of application [1,17].

## Conclusions

There was no significant difference between sensikin gel, sodium fluoride gel and fluoride varnish in reducing dentin hypersensitivity after 1 week, 1 month and 3 months with respect to air stimuli. Sensikin gel was more efficient than fluoride varnish in reducing sensitivity caused by periodontal probe after 1 month. Sensikin gel, sodium fluoride gel and fluoride varnish can all be prescribed to reduce dental sensitivity in patients who undergo periodontal treatments. In the case of severe sensitivity to mechanical stimulations for immediate treatment, fluoride varnish is recommended and if the pain persists, a treatment with a long-run effectiveness such as sensikin and/or

sodium fluoride gel is suggested.

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