

Research Article

Desensitizing Efficacy of Foam Containing Potassium Nitrate 5% and Toothpaste Containing Strontium Acetate in Dentin Hypersensitivity: An Eight-Week Clinical Study

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Abstract

Background and aims. The aim of this study was to evaluate the clinical desensitizing effects of potassium nitrate and strontium acetate in reduction of hypersensitivity.

Materials and methods. Thirty eight patients who presented dental hypersensitivity were selected and randomly allocated into two groups. Group I: patients who were treated by potassium nitrate 5% foam, and group II: patients that were treated by strontium acetate toothpaste. Subjects in each group were requested to use their foam or dentifrice twice daily for 2 months. Dentinal hypersensitivity examinations were conducted at baseline using the visual analogue scale (VAS) and dry ice spray, first immediately after treatment and then after 4 and 8 weeks of using the products. The findings were analyzed using paired t-test and ANOVA test.

Results. VAS score did not show any significant difference between the two groups before treatment. Analysis of study findings showed no significant difference between the two groups in each period of treatment (P-value > 0.05), but both groups showed significant differences before intervention compared to different intervals of treatment (time 0, 4W, 8W) (P-value < 0.001).

Conclusion. Both potassium nitrate and strontium acetate are effective in decreasing tooth hypersensitivity and their desensitizing effect will increase by time passing, but none has preference over the other.

Key words: Potassium nitrate, Strontium acetate, Tooth hypersensitivity.

Introduction

Dentin hypersensitivity (DH) is one of the most common complications that affect patients after periodontal therapy.¹ It is defined as a short and sharp pain arising from exposed dentin, in response to chemical, thermal, tactile or osmotic stimuli that can not be explained as arising from other forms of old dental defect or pathology.^{2,3} DH is prevalent amongst a large portion of individuals 30 to 40 years of age.⁴ Females appear to suffer more than males presumably due to their overall health care and better oral hygiene awareness.⁵ The most consistent reported prevalence for DH is 15%.⁶ Through the centuries, complaints of tooth hypersensitivity have resulted in the use of hundreds of substances for the reduction or elimination of this painful human condition.⁷ Nowadays, various treatment options have been used for management of DH such as toothpastes and gels⁸⁻¹¹, adhesive resins¹²⁻¹⁴ and lasers.^{1,15,16} Toothpastes are the most widely used methods for delivering desensitizing agents.¹⁷ The availability of an OTC (over-the-counter) desensitizing toothpaste to provide faster relief than currently available toothpaste would, however, appear to be a significant advance in the treatment of DH.¹⁸ There are two treatment modalities in the treatment of DH: alteration of fluid flow in the dentinal tubules, and modification or blocking of the pulpal nerve response.¹⁹ Toothpaste constituents have been proposed to occlude dentinal tubules.²⁰ For generalized sensitivity involving several teeth, the use of OTC toothpastes such as potassium nitrate and strontium-containing products has shown to be clinically effective in well-controlled clinical studies and they are readily available to the consumer.^{21,22}

Although additional ingredients in dentifrices, in particular the abrasive elements, have also been suggested to be of importance.²³ A meta-analysis undertaken by Poulsen *et al.* on a limited number of accepted studies meeting their criteria indicated that the efficacy of potassium nitrate to reduce DH is not strongly supported by the literatures.²⁴ Further studies however have been reported in the literature since 2000 that would appear to support the clinical efficacy of potassium-containing salts.^{25,26} Strontium salt has also dominated the market of desensitizing pastes for the last 30 years.²⁷

Following the advisory comment of the Cochrane association about the demand of more comparative articles²⁴, the purpose of the present study is to compare two commercially available desensitizing

agents: foam containing potassium nitrate 5%, and dentifrice containing strontium acetate over a period of 8 weeks.

Materials and Methods

This was a prospective randomized controlled clinical study. Thirty eight patients ranging in age from 13 to 53 years old with a diagnosis of DH were selected randomly and divided into two groups according to the treatment. Inclusion criteria included: feeling pain because of the use of irritant subjects or breathing in cold weather, periodontal pocket depth < 4mm, not using other routine desensitizing agents such as dentifrices or tubular sealers, and having a good oral hygiene habit. Abutments, cracked teeth, teeth with congenital defects, extensive restorations, caries, prosthetic crown and a history of root canal therapy were excluded.

All subjects provided oral and written consent. In both groups after oral hygiene instruction, patients were asked to brush their teeth without any toothpaste. The assessment method used to quantify sensitivity, was using the dry ice spray (Friscospray-Germany) recorded by the visual analogue scale (VAS). The VAS index consists of a vertical line, 10 cm long, with a numeric scale from 0 to 10. Patients were asked to rate their pain so that 0 describes "no pain" and 10 shows "severe pain" (like the pain of contraction or amputation).

In the first group after registration of the pain, foam containing potassium nitrate 5% (Sensodyne Iso Active Foam Gel-Sensodyne-Germany) was put and rubbed locally on the cervical portion of the hypersensitive teeth for about 60 seconds and was then rinsed. Then the teeth were again examined immediately by VAS index and the subjects used the foam twice a day for two months, each time for one minute (according to the manufacturer's instruction). Since Holland *et al.* (28) have recommended at least a follow up period of 8 weeks for the trials on hypersensitivity, so the pain was assessed again 4 and 8 weeks after the first visit (in the middle and at the end of the therapeutic period).

In the second (strontium acetate (Sensodyne Rapid Action –United Kingdom treated)) group, after recording the VAS score, patients used strontium acetate toothpaste using a brush and then the pain was examined and sensitivity scores were recorded again.

Participants were instructed to brush their teeth twice daily with their assigned dentifrice. Other intervals were the same as that of the first group (4 and 8 weeks). Subject assessments were performed by the same examiner throughout the study. The data obtained were analyzed using SPSS software, repeated measurement ANOVA test and Paired t-test. The significance level was set at 0.05.

Results

Repeated measurement ANOVA showed statistically significant differences in all intervals (immediately after the first application, fourth and eighth weeks) compared to before treatment (P -value < 0.001). There was no significant difference between two groups at different time intervals (P -value > 0.05).

The mean and standard deviation (SD) of VAS values in both groups through the study period are summarized in Table 1. Chart 1 shows average changes of VAS index in each group.

Table 1: Mean \pm SD of VAS score in different treated groups at different time intervals

Time interval	Prior to treatment	Immediately after treatment	Fourth week	Eighth week
Potassium nitrate	4.63 \pm 2.31	3.75 \pm 1.77	2.10 \pm 2.10	1.73 \pm 1.31
Strontium acetate	5.28 \pm 1.75	3.78 \pm 1.78	2.68 \pm 1.60	1.37 \pm 2.31
P-value	0.41	0.82	0.88	0.93

Discussion

The purpose of the present study was to compare both short-term and long-term effects of two desensitizing at-home approaches for management of Dentin hypersensitivity (DH); foam containing potassium nitrate 5% and strontium acetate dentifrice. It must be mentioned that the cause of using the foam form of potassium nitrate is its novelty in the market which is claimed for this form of product to not interfere with active ingredients. DH was evaluated before treatment (baseline), immediately after treatment, one and two months later using VAS index. There was no statistically significant difference between the two groups (P -value > 0.05) prior to treatment that would indicate similar severity of hypersensitivity and random distribution of them.

The amount of VAS scores at the study period after treatment demonstrated significant reduction in the potassium nitrate treated groups compared to before the treatment (P -value < 0.05), which shows both immediate and delayed effects of potassium nitrate on the management of hypersensitivity and is inconsistent with other related literatures.²⁹⁻³¹

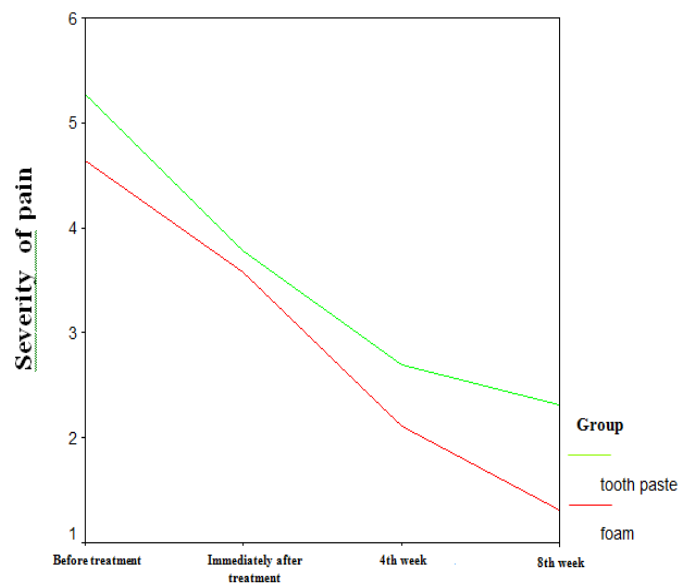


Chart 1: The average changes of VAS index in each group

However various studies reported merely a delayed effect of potassium nitrate.^{19,32} Findings about mean of VAS score in strontium acetate treated group after treatment in comparison with before treatment were like that of the first group (significant reduction of DH (P -value < 0.05)). Both immediate and delayed efficacy of strontium in the management of sensitive teeth has been demonstrated in some previous investigations.^{33,34} Although similar studies proposed a control group treated by placebo, but due to the proved efficacy of listed compounds, we ignored having a control group. One of the requirements for treatment of DH according to Grossman is rapidity in action.³⁵ This criterion does not exist in most available dentifrices, in which the therapeutic efficacy usually appears after repeated application and over time. So the immediate effect of both potassium nitrate and strontium acetate is a preferable benefit which distincts them from other popular toothpastes. In an overall comparison, in different evaluation times, no significant differences were observed between the two groups in alleviating sensitivity, and their effects have been increased during time. Finally, it must be mentioned that

evaluating the treatment of DH is a complicated process because of different natural mechanisms which remit tooth sensitivity over time, including sclerosing of dentin or formation of secondary, and tertiary or reparative dentin,³⁶ which can affect interpretation of delayed efficacies of our materials. Also in clinical positions, subjects may report lower pain due to experimental subordinations or as a cause of being polite.³⁷

Conclusion

Based on our results, both potassium nitrate 5% foam and strontium acetate toothpaste poses immediate and delayed therapeutic effects in remitting the pain of sensitive teeth, and these two compounds do not have any advantages over each other regarding treatment of dentin hypersensitivity.

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