

A Clinical Trial to Evaluate the Efficacy of 5% Potassium Nitrate Gel on Sensitivity During Ultrasonic Scaling

Abstract

Context: Ultrasonic scaling is a routinely performed procedure in dental practice. During ultrasonic scaling, sensitivity of teeth is a common occurrence. The sensitivity of teeth causes discomfort and pain to many patients. The potassium nitrate is an antihypersensitivity agent used effectively in dentifrices. **Aims:** The aim of the study is to evaluate the efficacy of 5% potassium nitrate gel application on the reduction of sensitivity during ultrasonic scaling. **Settings and Design:** This study is a randomized controlled trial with a split-mouth design. A total of 100 patients were recruited in the study after informed consent. **Subjects and Methods:** Mandibular anterior teeth were selected as the area for study. About 5% potassium nitrate gel was applied to the left or right side of the teeth. After 5 min, ultrasonic scaling was performed for both test and control sides. Visual analog scale (VAS) and patient satisfaction were recorded for both the groups. **Statistical Analysis Used:** An unpaired *t*-test was used to analyze the mean VAS scores with the area treated with or without application of 5% potassium gel during ultrasonic scaling. Chi-square test was used to analyze the satisfaction level with the test and control group. **Results:** The mean VAS scores and patient satisfaction for the test group were ($P < 0.001$) statistically significant as compared to the control group. **Conclusions:** Potassium nitrate gel can be effectively used before ultrasonic scaling to reduce sensitivity.

Keywords: Potassium nitrate gel, sensitivity, ultrasonic scaling

Introduction

The treatment for the periodontal disease involves nonsurgical and surgical periodontal therapy. The instrumentations utilized are hand-driven and power-driven instruments. This power-driven instruments are sonic and ultrasonic scalers. Ultrasonic instrumentation is an integral component of the clinical curriculum and the majority of the dental hygiene programs.^[1]

Ultrasonic is power-driven instruments used in periodontal therapy for the removal of plaque and calculus. However, this equipment is associated with a number of hazards. These include heating of the tooth during scaling, vibration hazards causing cell disruption, and others.^[2]

The ultrasonic tips vibrate on a tooth with frequency in the range of 25,000–42,000 Hz.^[3] This vibration can cause dental hypersensitivity to patients. The sensitivity of teeth is caused during and after scaling lasting for 1 day to 3 months. The prevalence of sensitivity is 62%–90%

after scaling.^[4] The intensity of sensitivity is mild to severe reported with various studies.^[3-5]

The patients experienced minimal to moderate pain during scaling. Dental pain, anxiety, and fear may result in avoiding dental treatment.^[5] Scaling causes root surface damage or hypersensitivity.^[6] To increase compliance of the patients, there is a need to reduce pain during scaling.

The pain and discomfort during ultrasonic scaling can be reduced by application of topical anesthesia. The use of topical anesthesia for ultrasonic scaling is being practiced in the past. Significant reduction of pain was reported with topical anesthesia used before ultrasonic scaling.^[7]

The potassium nitrate as desensitizing agents in toothpaste has been effective in reducing the sensitivity within 2 days to weeks.^[8] The aim of the present study was to evaluate the efficacy of 5% potassium nitrate gel as desensitizing agents during the ultrasonic scaling. This study is useful as its results can be used as a reference for incorporating potassium nitrate in

**Nilofar B. Attar,
Rajesh P. Gaikwad,
Akshaya B.
Banodkar,
Gulnar D. Sethna**

*Department of Periodontology,
GDC and H, Mumbai,
Maharashtra, India*

Address for correspondence:

*Dr. Nilofar B. Attar,
Department of Periodontology,
GDC and H, Mumbai,
Maharashtra, India.
E-mail: nilo_attar@yahoo.com*

Access this article online

Website: www.jdrr.org

DOI: 10.4103/jdrr.jdrr_62_18

Quick Response Code:



How to cite this article: Attar NB, Gaikwad RP, Banodkar AB, Sethna GD. A clinical trial to evaluate the efficacy of 5% potassium nitrate gel on sensitivity during ultrasonic scaling. *J Dent Res Rev* 2019;6:9-12.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

daily practice to reduce the discomfort during ultrasonic scaling.

Subjects and Methods

This study was a randomized controlled clinical trial with a split-mouth design. A total of 100 patients reported to the department of periodontology were included in the study. The patients' informed consent was obtained and scheduled for scaling appointment. The mandibular anterior teeth were selected as the region for the study as they are the most sensitive teeth during scaling. The teeth with abrasion, attrition, erosion, and dental caries were excluded from the study. Mandibular right or left anterior teeth were selected as test or control sites. Inclusion criteria were patients requiring scaling of mandibular anterior teeth. Patients with caries, abrasion, and attrition on mandibular anterior teeth were excluded from the study.

Test group: 5% potassium nitrate gel + ultrasonic scaling.

Control group: Ultrasonic scaling only.

The mandibular teeth were isolated, and 5% potassium nitrate gel, Sensigel from Win Medicare [Figure 1], was applied to left or right mandibular teeth. The gel was left in place for 5 min. Ultrasonic scaling was performed with mandibular anterior teeth [Figure 2]. The water and power control was kept constant throughout the study. The time limit for scaling per tooth was maximum 3 min per tooth. After ultrasonic scaling, the patient visual analog scale (VAS) was recorded [Figure 3] for both the test and control areas.

The patient satisfaction and preference for gel application were recorded for both groups. Patient satisfaction was recorded as YES/NO. Side effects or any untoward effects during the procedure were also recorded.

Results

Statistical analysis

Statistical software Graph pad Prism 7 (GraphPad Software, Inc.) was used to perform statistical analysis.

The mean VAS scores for test and control groups were analyzed with unpaired *t*-test [Table 1 and Graph 1].

The mean VAS scores for the test group were ($P < 0.001$) statistically significant as compared to the control group.

The patients with VAS scores were grouped as:

- Mild: VAS scores 0–3 (40 patients)
- Moderate: VAS scores 4–6 (48 patients)
- Severe: VAS scores 7–8 (12 patients).

The efficacy of 5% potassium nitrate gel application before ultrasonic scaling was assessed with different VAS scores. The 5% potassium nitrate gel was found to be effective in the following percentage of VAS scores.



Figure 1: 5% potassium nitrate gel



Figure 2: Ultrasonic scaling after gel application

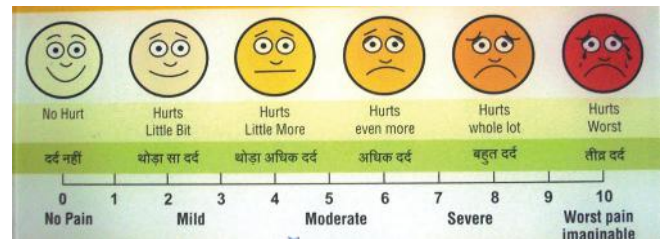


Figure 3: Visual analog scale

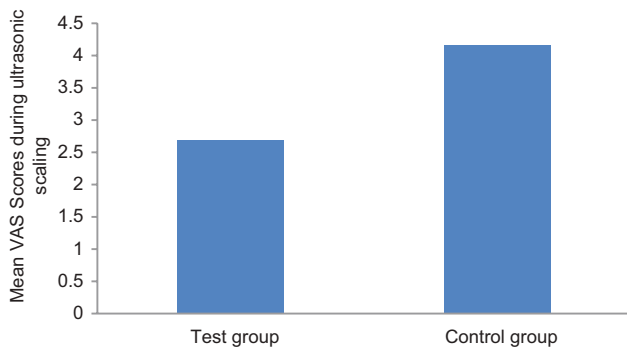
Table 1: Mean visual analog scores for test and control group

Group	n	Mean VAS score±SDV	Unpaired t-test
I Test group (5% potassium nitrate gel + ultrasonic scaling)	100	2.69±2.27	$P < 0.001$
II Control group (ultrasonic scaling only)	100	4.17±1.89	

VAS: Visual analog score, SDV: Standard deviation

Mild (32/40): 80%, moderate (37/48): 77.08%, and severe (3/12):25%.

Potassium nitrate gel was found to be effective in 77%–80% of mild and moderate tooth sensitivity patients.



Graph 1: Mean visual analog scale scores for the test and control group

Eighty-nine percent of the patients preferred the application of gel before scaling. The patient satisfaction with test and control groups was analyzed with Chi-square test.

Patient satisfaction with test group was ($P < 0.001$) statistically significant as compared to the control group [Table 2 and Graph 2].

Discussion

Ultrasonic scaling is the routinely performed procedure in dental practice. The ultrasonic scaling is an essential part in both treatment and maintenance phases of periodontal therapy. The procedure is less invasive, but causes discomfort due to the development of hypersensitivity.^[3-5] The friction produces by vibrating tips along with the water spray during scaling cause sensitivity.^[3]

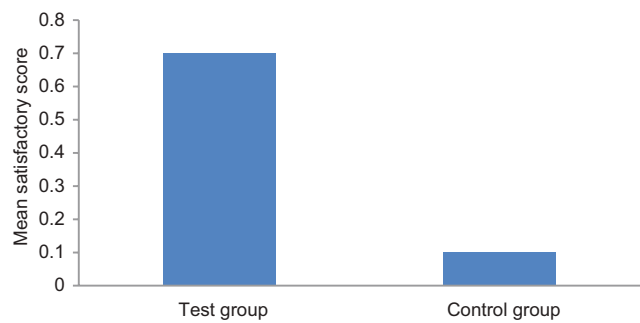
Several approaches have been performed to reduce the discomfort during ultrasonic scaling and to make the procedure less troublesome. Ultrasonic with slim-line inserts has been studied which resulted in reduction of pain sensations compared with conventional ultrasonic scalers.^[9] To reduce the temperature sensitivity during ultrasonic scaling, warm water was recommended to be added to the water supply.^[10]

The treatment for hypersensitivity includes desensitizing agents such as potassium nitrate, fluorides, oxalates, varnish, adhesive resins, bioglass, casein phosphopeptide, amorphous calcium phosphate, laser, and others.^[11]

Potassium nitrate is the most commonly used desensitizing agents. It depolarizes the nerves and blocks the dentinal tubules. It is available in the concentrations of 1%, 2%, 5%, 10%, and 15%. The potassium nitrate penetrates enamel and dentin and its penetration depends on the concentration and viscosity.^[12]

The 5% potassium nitrate gel was used effectively for the treatment of sensitivity.^[13] The 5% potassium nitrate gel is known to reduce immediate pains score.^[14,15]

The potassium nitrate gel showed a reduction of VAS scores and was found to be effective for the treatment of dentinal hypersensitivity. The pain reduction is due to the



Graph 2: Mean satisfactory score for test and control group

Table 2: Mean satisfactory score for test and control group

Group	n	Mean satisfactory score±SDV	Chi-square test
I Test group (5% potassium nitrate gel + ultrasonic scaling)	100	0.71±0.46	$P < 0.001$
II Control group (ultrasonic scaling only)	100	0.1±0.30	

SDV: Standard deviation

depolarization of the nerve and the blockage of dentinal tubules.

The oxalic acid was also effectively used as desensitizing agent to reduce sensitivity during periodontal therapy.^[16]

In the present study, mandibular anterior teeth were assessed for pain sensation during ultrasonic scaling. The mandibular anterior teeth are known to accumulate more plaque and calculus.^[7] Furthermore, these teeth are the most sensitive during ultrasonic scaling.

The gel was applied for 5 min and ultrasonic scaling was performed. The time span was sufficient enough for penetration of potassium nitrate gel into the dentinal tubules. The desensitization of dentinal nerves reduces hypersensitivity.^[17]

The patients were assessed for VAS with or without 5% potassium nitrate gel application during ultrasonic scaling. Forty percent of patients suffer from mild pain, 48% from moderate, and 12% with severe pain.

The 5% potassium nitrate gel is effective for reducing VAS scores during ultrasonic scaling. There was a statistically significant difference ($P < 0.001$) between the test and control sites. During ultrasonic scaling, 5% potassium nitrate gel were 80%, 77.08%, and 25% times effective against mild, moderate, and severe VAS scores, respectively. The gel is effective with mild-to-moderate VAS scores and marginally effective with higher scores. The patient with higher VAS may require a higher concentration of potassium nitrate gel application. The duration of the gel application should also be increased for better effect. The deeper penetration of potassium

Downloaded from http://journals.lww.com/jdr by BHM/fepPhKav1zEuum1tQIN4a+kULHEZgbsHh04XM0hCwvCX1AW nYOp/IIQHd3i3D000Rry7TVvSF14C13VC1y0abggQZXdgGj2mWIZLeI= on 03/14/2024

nitrate gel may reduce the hypersensitivity caused during scaling.

The time limit of 3 min per tooth was kept as thorough ultrasonic scaling can be completed within this time span. The previous study by Graetz *et al.* and Torfason *et al.* reported time span for ultrasonic scaling per tooth as 2 min and 2.10 min, respectively.^[18,19]

The patient satisfactory level with gel application was higher with the test group. The patient preferred gel application before the ultrasonic scaling procedure. The satisfactory level and acceptance of the topical application of 5% potassium nitrate were similar to oxalate application in the previous study.^[20]

There were no side effects with gel application during the study. The taste and flavor of the gel were acceptable to the patients. The application of the gel is easy and none complicated in routine dental practice.

Conclusions

Ultrasonic scaling causes mild-to-severe discomfort. The use of 5% potassium nitrate gel during ultrasonic scaling effectively reduces the sensitivity. The effect of desensitizers lasts for a short duration. The concentration used in the present study is effective against the lower and moderate VAS score. For higher VAS scores, the desensitizers were not found to be effective in reducing the pain. Thus, future studies and research are required with a higher concentration of potassium nitrate to relieve pain and discomfort in patients with higher pain threshold.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Hinchman SS, Funk A, DeBiase C, Frere C. Ultrasonic instrumentation instruction in dental hygiene programs in the United States. *J Dent Hyg* 2016;90:135-42.
- Oda S, Nitta H, Setoguchi T, Izumi Y, Ishikawa I. Current concepts and advances in manual and power-driven instrumentation. *Periodontol* 2000 2004;36:45-58.
- Trenter SC, Walmsley AD. Ultrasonic dental scaler: Associated hazards. *J Clin Periodontol* 2003;30:95-101.
- Lin YH, Gillam DG. The prevalence of root sensitivity following periodontal therapy: A Systematic review. *Int J Dent* 2012;2012:407023.
- Guzeldemir E, Toygar HU, Cilasun U. Pain perception and anxiety during scaling in periodontally healthy subjects. *J Periodontol* 2008;79:2247-55.
- Gunsolley JC. The need for pain control during scaling and root planing. *Compend Contin Educ Dent* 2005;26:3-5.
- Chung JE, Koh SA, Kim TI, Seol YJ, Lee YM, Ku Y, *et al.* Effect of eutectic mixture of local anesthetics on pain perception during scaling by ultrasonic or hand instruments: A masked randomized controlled trial. *J Periodontol* 2011;82:259-66.
- B Low S, Allen EP, Kontogiorgos ED. Reduction in dental hypersensitivity with nanohydroxyapatite, potassium nitrate, sodium monofluorophosphate and antioxidants. *Open Dent J* 2015; 27:927.
- Malagi S, Pattanshetti K, Bharmappa R, Reddy AS, Pai J, Joseph R, *et al.* Assessment of subjective intensity of pain during ultrasonic supragingival calculus removal: A comparative study. *J Indian Soc Periodontol* 2014;18:472-7.
- Paramashivaiah R, Prabhuji ML. Mechanized scaling with ultrasonics: Perils and proactive measures. *J Indian Soc Periodontol* 2013;17:423-8.
- Davari A, Ataei E, Assarzadeh H. Dentin hypersensitivity: Etiology, diagnosis and treatment; a literature review. *J Dent (Shiraz)* 2013;14:136-45.
- Hodosh M, Hodosh SH, Hodosh AJ. KNO₃/benzocaine/tetracaine gel use for maintenance visit pain control. *Gen Dent* 2007;55:312-5.
- Kwon SR, Dawson DV, Schenck DM, Fiegel J, Wertz PW. Spectrophotometric evaluation of potassium nitrate penetration into the pulp cavity. *Oper Dent* 2015;40:614-21.
- Raichur PS, Setty SB, Thakur SL. Comparative evaluation of diode laser, stannous fluoride gel, and potassium nitrate gel in the treatment of dentinal hypersensitivity. *Gen Dent* 2013;61:66-71.
- Miglani S, Aggarwal V, Ahuja B. Dentin hypersensitivity: Recent trends in management. *J Conserv Dent* 2010;13:218-24.
- Sabyasachi S, Jagannath GV, Krishna R, Shaffat M, Sanjay S. Effectiveness and tolerability of Fluorinol in Indian patients with dentinal hypersensitivity: A double blind controlled trial. *Indian J Contemp Dent* 2014;2:96101.
- Purra AR, Mushtaq M, Acharya SR, Saraswati V. A comparative evaluation of propolis and 5.0% potassium nitrate as a dentine desensitizer: A clinical study. *J Indian Soc Periodontol* 2014;18:466-71.
- Graetz C, Plaumann A, Bielfeldt J, Tillner A, Sälzer S, Dörfer CE, *et al.* Efficacy versus health risks: An *in vitro* evaluation of power-driven scalers. *J Indian Soc Periodontol* 2015;19:18-24.
- Torfason T, Kiger R, Selvig KA, Egelberg J. Clinical improvement of gingival conditions following ultrasonic versus hand instrumentation of periodontal pockets. *J Clin Periodontol* 1979;6:165-76.
- Suda T, Kobayashi H, Akiyama T, Takano T, Gokyu M, Sudo T, *et al.* Desensitizing agent reduces dentin hypersensitivity during ultrasonic scaling: A pilot study. *J Clin Diagn Res* 2015;9:ZC46-9.