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ORIGINAL ARTICLE

Evaluation of Efficacy of Arginine Calcium Carbonate Versus Potassium Nitrate Paste in the treatment of Dentinal Hypersensitivity

ZOHA WISAL KHAN[1], SANA AHMAD[2], AYOUSHA IQBAL[3], SAAD MANSOOR[4], NIDA FATIMA[5], ZAINAB JAVED[6]
[1]CEO Dr. Zoha's Clinics, Islamabad.
[2]General Dentist, Dr. Zoha's Clinics, Islamabad.
[3]Head of Department, Assistant Professor, Department of Dental Materials, HBS Medical and Dental College, Islamabad.
[4]Assistant Professor, Department of Prosthodontics, Foundation University College of Dentistry and Hospital, Islamabad.
[6]Demonstrator, Department of Oral Medicine, School of Dentistry, SZABMU, Islamabad.
[7]General Dentist, Facial Aesthetician (Royal Academy of Facial Esthetics), J.A Aesthetics and Dental Care, Blue Area, Islamabad.
Corresponding Author: Ayousha Iqbal, Email: ayoushaiqbal@live.com

ABSTRACT

Background and Aim: Dentin hypersensitivity (DH) is a frequent oral health condition that affects one or more teeth in many adults characterized by a severe pain of exposed dentin to an external stimulation. The present study aimed to assess the efficacy of arginine calcium carbonate versus potassium nitrate paste in the dental hypersensitivity treatment.

Materials and Methods: This randomized controlled trial was carried out on 56 subjects in the Department of Dentistry of a Tertiary Care Hospital from January 2021 to December 2022. All the subjects were divided into two groups: Group-I as test group (toothpaste containing 8% arginine and calcium carbonate and toothpaste containing 5% potassium nitrate) and Group-II as control group. Schiff Cold Air Sensitivity scale was used for recording the air blast stimuli at baseline and DH scores were used for tactile stimuli on visual analog scale immediately post scaling after desensitizing paste application. Subjects were followed-up for 1 month. SPSS version 27 was used for data analysis.

Results: The subjects in test-group had decreased sensitivity values 2.52± 0.31 at baseline to post scaling after desensitizing paste application value of 1.87 ± 0.28. The sensitivity further reduced to 1.12 ± 0.39 after paste use for one month and 1.07± 0.42 after one month cessation of its use. Both tooth pastes significantly alleviated dental hypersensitivity. The arginine and calcium carbonate presented better clinical response than potassium nitrate paste after 1 month assessment.

Conclusion: The arginine and calcium carbonate showed better clinical response than potassium nitrate paste in terms of long-term reduction in dentinal hypersensitivity symptoms.

Keywords: Dentinal hypersensitivity, Arginine and calcium carbonate, Potassium nitrate, Efficacy, Dental Pulp.

INTRODUCTION

Non-noxious stimuli produce dentinal hypersensitivity[1]. This ailment affects more than 40 million people in the United States each year[2], and it affects roughly 21.12% of women in Pakistan[3]. Symptoms may subside later in life as a result of age-related dentin and pulpal changes[4]. Based on dentinal fluids' theories and modified hydrodynamics, numerous agents such as calcium compounds, tubular occlusion caused by photobiomodulation, and potassium nitrate have been utilized for dentinal tubules' partial blocking[5-7]. Recently, arginine calcium carbonate (8%) has been used for short term relief in this regard[8]. Dentinal hypersensitivity and exposed dentin could be caused by progressive loss of tooth structure particularly enamel wear known as attrition[9]. The acute pain caused by tactile, external chemical, osmotic stimulation, and thermal agents all is characterized by dentinal hypersensitivity[10, 11]

DH management, while being well-established, has been proven to be difficult for dentists as far as the alleviation of patient's suffering is concerned. Many ways have been explored, and new abrasives with novel ingredients are continuously being brought to the market, but their promise for totally removing sensitivity is questionable[12]. The treatment of dentinal hypersensitivity focuses on closing the dentinal tubules with various molecules/ingredients[13]. Potassium nitrate and others were among the most regularly utilized. Arginine calcium carbonate was recently discovered to be effective in the treatment of DH[14]. There has been little research regarding the effectiveness of potassium nitrate against arginine calcium carbonate in treating dentinal hypersensitivity. As a result, the purpose of this study is to assess the effectiveness of these components in controlling/decreasing DH.

METHODOLOGY

This randomized controlled trial was carried out on 56 subjects in the Department of Dentistry of a Tertiary Care Hospital from January 2021 to December 2022. All the subjects were categorized into two groups: Group-I as test group (toothpaste containing 8% arginine and calcium carbonate and toothpaste containing 5% potassium nitrate) and Group-II (controls). Schiff Cold Air Sensitivity scale was used for the recording the air blast stimuli at baseline and DH scores were used for tactile stimuli on visual analog scale immediately post scaling after desensitizing paste application. Subjects were followed-up for 1 month. Patients aged 16 to 65 years old with at least two teeth hypersensitive to heat, cold, or sour stimuli were enrolled. Individuals with defective restorations, chipped teeth, dentures, fractured teeth, and individuals who had periodontal surgery within the previous 6 months were excluded. Using other oral hygiene products or considering any other dental therapy for hypersensitivity was not authorized during the trial period. Within 24 hours following the examination, no drugs that might modify pain perception were allowed to be used. Following a baseline sensitivity examination, both groups received supragingival scaling using hand tools. The dentifrice was then administered directly to the buccal cervical region of exposed dentin with a fingertip, and the sensitivity levels were assessed 5 minutes later. Each group received specific dentifrice and was instructed to brush their teeth as usual (modified bass method) for 3 minutes, twice daily, using a soft bristle toothbrush.

RESULTS

The subjects in test-group had decreased sensitivity values 2.52± 0.31 at baseline to post scaling after desensitizing paste application value of 1.87 ± 0.28. The sensitivity further reduced to 1.12± 0.39 after paste use for one month and 1.07± 0.42 after one month cessation of its use. Both toothpastes significantly alleviated dentinal hypersensitivity. The arginine and calcium carbonate presented better clinical response than potassium nitrate paste after 1 month assessment. Sensitivity levels in the Control group decreased from 2.62±0.28 at baseline to 2.19±0.32 after scaling. It further decreased to 1.41±0.32 after one month of using desensitizing paste and was 1.61±0.51 after one month of not using it. Following air stimuli, the mean Schiff Cold Air Sensitivity scale value for both groups was determined. The tactile sensitivity

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compared for both groups is shown in Table-I. Air blast Sensitivity compared in both groups is shown in Table-II.

Table 1: Comparison of tactile sensitivity in both test and control groups.

Variables	Group-I (test subjects) Mean ± SD	Group-II (controls) Mean ± SD	p-value
Baseline	2.52± 0.31	2.62 ± 0.28	0.21
After desensitizer application	1.87 ± 0.28	2.19 ± 0.32	<0.01
One month after cessation of desensitizer	1.07± 0.42	1.41 ± 0.32	<0.01
One month of commencing the desensitizer use	1.12± 0.39	1.38 ± 0.33	<0.01

Table 2: Air blast Sensitivity compared in both groups.

Variables	Group-I (test subjects) Mean ± SD	Group-II (controls) Mean ± SD	p-value
Baseline	7.29 ± 0.39	7.72 ± 0.49	<0.01
After desensitizer application	6.42 ± 0.41	6.89 ± 0.59	<0.01
One month after cessation of desensitizer	4.88 ± 0.59	5.79± 0.59	<0.01
One month of commencing the desensitizer use	4.83 ± 0.58	6.10 ± 0.72	<0.01

DISCUSSION

Many treatment approaches try to diminish dentinal sensitivity by blocking the dentinal tubules, based on the hydrodynamic principle. Iontophoresis introduces ions or ionized medicines into the tissues using a low amperage direct electrical current. In this trial, both arginine/calcium carbonate (8%) and potassium nitrate (5%) significantly reduced the dentinal hypersensitivity to a prolong time from baseline. These findings were consistent with results of some earlier studies[15, 16]. DH is a frequent complication manifested by transient and quick response during routine practices to stimulus such as drinking, breathing, and eating in turn impacting the patient's life quality. As people who keep their teeth intact for longer periods of time and their diets change, it is normal to expect more cases of dentin hypersensitivity and, as a result, more requests for treatment[17].

Dentin sensitivity's hydrodynamic process provides a foundation for researching desensitizing treatments. The huge number of treatments and therapeutic alternatives to relieve DH demonstrates the difficulties in treating it[18]. Treatments can be administered by the patient at home, who are simple, affordable, and more cooperative, or by a dental expert in the dental office, depending on their method. However, the disadvantages of these therapies include compliance, difficulty in delivering an agent to a particular location, a sluggish start of effect, and the need for continuing administration. Though in-office treatments are more difficult and often focus DH to one or a few teeth, they may be beneficial for delivering fast alleviation of hypersensitivity[19]. Hypersensitivity reduces patient compliance, especially during the early post-scaling weeks[20].

Patients who have had periodontal treatment, in contrast, are four times more susceptible to develop hypersensitivity in general population[21]. The advantage of Pro-Argin technology is its capacity to provide immediate relief[22]. Lavender's studies using confocal laser scanning microscopy (CLSM) and high resolution scanning electron microscopy (SEM) images demonstrated that arginine calcium carbonate is highly effective in occluding the open dentinal tubules and that the occlusion achieved is acid resistant. Because arginine produces a long-lasting acid resistant effect, it assists in providing rapid relief[23].

Cunha-Cruz et al[24] reported that the tactile sensitivity could be effectively improved by arginine-containing toothpaste as compared to other desensitizing components after 4 and 8 weeks. When used as a single pre-procedural therapy before a professional dental cleaning technique, Hamlin et al found a statistically significant reduction in dentinal hypersensitivity when compared to a control pumice prophylaxis paste[25].

Favaro et al. [26] reported that the potassium ions concentration 5 minutes after treatment might render the nerves unexcitable due to insufficiency of potassium ions to show its action thus taking longer to approach to the nerve in dentinal tubules. The effect of potassium ions on desensitization diminished with time, which might be due to a reduction in ion concentration in dentinal tubules, which could explain the rise in sensitivity after ceasing the control paste [27].

Athuluru et al. [28] demonstrated that arginine toothpaste's (8.0%) self-application provided immediate sensitivity alleviation. According to a research conducted by Bandekar et al, [29] an arginine-containing regimen provided much quicker dentine hypersensitivity alleviation than a potassium nitrate-containing treatment paste.

CONCLUSION

The arginine and calcium carbonate showed better clinical response than potassium nitrate in terms of long-term reduction in dentinal hypersensitivity symptoms. After 2 months of clinical testing, both therapies revealed reduced sensitivity levels when compared to baseline, regardless of their respective routes of action.

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