

Comparative comparison of potassium nitrate toothpaste to arginine calcium carbonate on dental hypersensitivity management

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Abstract

Background: Dentinal hypersensitivity is a commonly encountered oral healthcare concern that affect a large proportion of humans across the globe including in India. It presents a sharp pain that originate from exposed dentin from external stimulus response and is not explained by any other pathology. It can be managed by various agents.

Aim: The present study was aimed to compare potassium nitrate toothpaste to Arginine calcium carbonate on dental hypersensitivity management.

Methods: The study assessed 132 subjects with dental hypersensitivity that reported to the Institute within the

defined study period. The subjects were divided into two groups of 66 subjects each where one test group was given toothpaste containing 8% Arginine and calcium carbonate and other control group managed with toothpaste containing 5% potassium nitrate. Scores for tactile stimuli were recorded on VAS and air blast stimuli on Schiff Cold Air Sensitivity scale at baseline, immediately post scaling after application of desensitizing paste, 1 month after using the paste and 1 month after stopped using of the paste.

Results: The study results showed that both the toothpastes were efficacious in relieving the dentinal hypersensitivity with acceptable outcomes and good

acceptance. However, the toothpaste that had 8% Arginine and calcium carbonate had better clinical response at the end of 2 months compared to 5% potassium nitrate.

Conclusion: The present study concludes that desensitizing toothpaste having 8% Arginine and calcium carbonate had rapid and long lasting effect on reduction of the symptoms associated with the dentinal hypersensitivity.

Keywords: Dentinal Hypersensitivity, Air Blast, Potassium Nitrate, Visual Analogue Scale, 8% Arginine and Calcium Carbonate

Introduction

Dentinal hypersensitivity is a short, exaggerated, painful response when opened dentine tubule orifices are exposed to thermal/ mechanical/ chemical stimuli. It is an unpleasant feeling caused from the stimulation of the A-beta and A-delta fibers in the teeth. It depicts a common clinical symptom having a high prevalence of nearly 4% to 57% and is commonly seen in adults in the age range of 20-49 years with highest incidence being recorded in age of 30-39 years and has higher predilection for female gender. The etiological agents for hypersensitivity are conditions as periodontal disease, dental caries, following flap surgery, faulty tooth brushing, wasting diseases, and gingival recession.¹

Different hypotheses have been proposed to address dentinal hypersensitivity, the most commonly accepted theory being fluid hydrodynamic theory which is dependent on the movement of fluid inside the dentinal tubules and was given by Brannstrom and Astrom in the year 1964. This theory states that exposed dentin has wide tubules having under calcified or thin smear layer that increase centrifugal fluid movement that activate the nerve endings at end of dentinal tubules or at pulp-dentin

junction leading to unpleasant condition and sensitivity in compared to unexposed dentin.^{2,3}

The treatment of dentinal hypersensitivity has been well-documented and is challenging for the dentists in eliminating the discomfort in the patients. Various methods have been used and newer abrasive agents have been introduced with newer ingredients, however, their potential is questionable in complete elimination of sensitivity. The treatment of dentinal hypersensitivity targets the dentinal tubules sealing with different ingredients or molecules.⁴

In these agents used commonly, potassium nitrate is one such agents. Presently, calcium carbonate and Arginine are found to be effective in the management of dentinal hypersensitivity. Till date, existing literature data is scarce concerning the efficacy of Arginine calcium carbonate to potassium nitrate in eliminating the dentinal hypersensitivity.⁵ Hence, the present study was aimed to compare potassium nitrate toothpaste to Arginine calcium carbonate on dental hypersensitivity management.

Materials and methods

The present clinical assessment study was aimed to compare potassium nitrate toothpaste to Arginine calcium carbonate on dental hypersensitivity management. The study subjects were from Department of Dentistry of the Institute. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed 132 subjects with dental hypersensitivity that reported to the Institute within the defined study period. The subjects were divided into two groups of 66 subjects each where one test group was given toothpaste containing 8% Arginine and calcium carbonate and other control group managed with

toothpaste containing 5% potassium nitrate. Scores for tactile stimuli were recorded on VAS and air blast stimuli on Schiff Cold Air Sensitivity scale at baseline, immediately post scaling after application of desensitizing paste, 1 month after using the paste and 1 month after stopped using of the paste.

All the subjects were initially assessed at baseline, immediately after the scaling, after topical application of the abrasive agent, 1 month after using desensitizing paste, and 1 month after discontinuation of desensitizing toothpaste. The inclusion criteria for the study were subjects aged 18-70 years with minimum two teeth depicting hypersensitivity to sour, cold, or hot stimulus, no condition associated with dentinal hypersensitivity, systemically healthy subjects, good periodontal health and probing depth of <3mm. The exclusion criteria for the study were subjects that underwent periodontal surgery within the previous 6 months, had bridgework, dentures, or orthodontic appliances that would interfere with the evaluation of hypersensitivity, teeth with deep dental caries, fractured teeth, defective restorations, or chipped teeth. Assessment of hypersensitivity was done using tactile means by air blast test as Schiff cold air sensitivity scale⁶ and VAS scale.

In the study time, subjects were not allowed any other oral hygiene product or any other treatment for hypersensitivity. Drugs that could affect pain perception were not allowed within 24 hours of evaluation. Subgingival scaling using hand instruments was done in all the subjects after baseline assessment. The dentifrice application was done using hand finger on buccal cervical area of exposed dentin and sensitivity was assessed after 5 minutes of application. Each group was given dentifrice and advised brushing using Modified bass technique for 2 minutes twice daily. Subjects were

recalled after 1 month and sensitivity scores were again recorded. Subjects were advised to discontinue the paste and continue usual fluoridated toothpaste. Subjects were again recalled after 1 month.

Statistical analysis of the gathered data was done using SPSS software version 26.0 (IBM Corp., Armonk, NY, USA) where intergroup comparison was done concerning sensitivity scores at different time intervals using independent t-test. The level of significance was considered at p-value of <0.05.

Results

The present clinical assessment study was aimed to compare potassium nitrate toothpaste to Arginine calcium carbonate on dental hypersensitivity management. The study assessed 132 subjects with dental hypersensitivity that reported to the Institute within the defined study period. The subjects were divided into two groups of 66 subjects each where one test group was given toothpaste containing 8% Arginine and calcium carbonate and other control group managed with toothpaste containing 5% potassium nitrate. Scores for tactile stimuli were recorded on VAS and air blast stimuli on Schiff Cold Air Sensitivity scale at baseline, immediately post scaling after application of desensitizing paste, 1 month after using the paste and 1 month after stopped using of the paste.

It was seen that for the comparison of tactile sensitivity in two groups of study subjects, at baseline mean value in test group was 2.45 ± 0.26 and was 2.55 ± 0.25 in control group with a non-significant difference with the p-value of 0.15. After applying the desensitizing paste, the mean value of sensitivity was 1.88 ± 0.01 in test group which was significantly lower when compared to mean values in control group with 2.19 ± 0.32 and the p-value of <0.01. After one month of applying the desensitizing

paste, the mean value of sensitivity was 1.07 ± 0.40 which was significantly lower when compared to mean values in control group with 1.37 ± 0.32 and the p-value of <0.01 . 1 months after stopping desensitizer use, the mean value of sensitivity was 1.04 ± 0.42 which was significantly lower when compared to mean values in control group with 1.57 ± 0.46 and the p-value of <0.01 (Table 1).

The study results showed that for air blast sensitivity comparison in two groups of study subjects, mean sensitivity scores were significantly lesser in test group compared to control group with the p-value of <0.01 . Similar results were seen after application of desensitizer where mean value in test group were 6.36 ± 0.37 and 6.91 ± 0.62 in control group with a significant difference and $p < 0.01$.

One month after using the desensitizing agents, mean sensitivity scores were significantly lesser in test group compared to control group with the p-value of <0.01 . One month after stopping the use of desensitizing agent, the mean air blast sensitivity values were significantly lesser in test group compared to control group with $p < 0.01$ (Table 2).

Discussion

The present study assessed 132 subjects with dental hypersensitivity that reported to the Institute within the defined study period. The subjects were divided into two groups of 66 subjects each where one test group was given toothpaste containing 8% Arginine and calcium carbonate and other control group managed with toothpaste containing 5% potassium nitrate.

Scores for tactile stimuli were recorded on VAS and air blast stimuli on Schiff Cold Air Sensitivity scale at baseline, immediately post scaling after application of desensitizing paste, 1 month after using the paste and 1 month after stopped using of the paste. This was

correlated to the previous studies of Anusha et al⁷ in 2020 and Purra AR et al⁸ in 2014 where study data and design comparable to the present study was also reported by the authors in their studies.

The study results showed that for the comparison of tactile sensitivity in two groups of study subjects, at baseline mean value in test group was 2.45 ± 0.26 and was 2.55 ± 0.25 in control group with a non-significant difference with the p-value of 0.15. After applying the desensitizing paste, the mean value of sensitivity was 1.88 ± 0.01 in test group which was significantly lower when compared to mean values in control group with 2.19 ± 0.32 and the p-value of <0.01 .

After one month of applying the desensitizing paste, the mean value of sensitivity was 1.07 ± 0.40 which was significantly lower when compared to mean values in control group with 1.37 ± 0.32 and the p-value of <0.01 . 1 months after stopping desensitizer use, the mean value of sensitivity was 1.04 ± 0.42 which was significantly lower when compared to mean values in control group with 1.57 ± 0.46 and the p-value of <0.01 . These results were in agreement with the findings of Hamlin D et al⁹ in 2009 and Pillai VP et al¹⁰ in 2013 where results reported by the authors were comparable to the results of the present study.

It was seen that for air blast sensitivity comparison in two groups of study subjects, mean sensitivity scores were significantly lesser in test group compared to control group with the p-value of <0.01 . Similar results were seen after application of desensitizer where mean value in test group were 6.36 ± 0.37 and 6.91 ± 0.62 in control group with a significant difference and $p < 0.01$. One month after using the desensitizing agents, mean sensitivity scores were significantly lesser in test group compared to control group with the p-value of <0.01 .

One month after stopping the use of desensitizing agent, the mean air blast sensitivity values were significantly lesser in test group compared to control group with $p < 0.01$. These findings correlated with the results of Madhavan S et al¹¹ in 2012 and Sharma S et al¹² in 2012 where air blast sensitivity comparison results comparable to the present study were also reported by the authors.

Conclusion

The present study, considering its limitations concludes that that desensitizing toothpaste having 8% Arginine and calcium carbonate had rapid and long lasting effect on reduction of the symptoms associated with the dentinal hypersensitivity.

References

1. Birang R, Naghsh N, Yaghini J, Mosavi F. Desensitizing efficacy of Foam Containing Potassium Nitrate 5% and Toothpaste Containing Strontium Acetate in Dentin Hypersensitivity: An Eight-Week Clinical Study. *J Periodontol Implant Dent*. 2013;5:18-22
2. Yang ZY, Wang F, Lu K, Li YH, Zhou Z. Arginine-containing desensitizing toothpaste for the treatment of dentin hypersensitivity: a meta-analysis. *Clin Cos-met Investing Dent*. 2016;8:1-14
3. Mantri V, Maria R, Alladwar N, Ghom S. Dentin Hyper sensitivity: Recent Concepts in Management. *Journal of Indian Academy of Oral Medicine and Radio logy*. 2011;23:115.
4. EliasBonetaAR1,RamirezK,NaboaJ,MateoLR,Stewart B, Panagokos F, De Vizio W. Efficacy in reducing dentine hypersensitivity of a regimen using a toothpaste containing 8% Arginine and calcium carbonate, a mouthwash containing 0.8% Arginine, pyrophosphate and PVM/MA copolymer and a tooth-brush compared to potassium and negative control regimens: an eight-week

randomized clinical trial. *J Dent*. 2013;41:42-9

5. Pradeep AR, Sharma A. Comparison of clinical efficacy of a dentifrice containing calcium sodium phosphosilicate to a dentifrice containing potassium nitrate and to a placebo on dentinal hypersensitivity: a randomized clinical trial. *J Periodontol*. 2010;81:1167-73
6. Pepelassi E, Rahiotis C, Peponi E, Kakaboura A, Vrotsos I. Effectiveness of an in-office Arginine-calcium carbonate paste on dentine hyper sensitivity in periodontitis patients: a double-blind, randomized controlled trial *J Clin Periodontol*. 2015;42:37-45
7. Anusha B, Murthy KRV. Evaluation of efficacy of Arginine calcium carbonate Vs potassium nitrate paste in the treatment of dentinal hypersensitivity. In *dJ Clin Res Dent* 2020;1:24-29
8. 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.
9. Hamlin D, Williams KP, Delgado E, Zhang YP, De-Vizio W, Mateo LR. Clinical evaluation of the efficacy of a desensitizing paste containing 8% Arginine and calcium carbonate for the in-office relief of dentin hypersensitivity associated with dental prophylaxis. *Am J Dent* 2009;22:16A-20A.
10. Pillai VP, Neelakantan P. Desensitizing tooth pastes for treatment of dentin hypersensitivity. *Int J Pharm Tech Res*. 2013;5:1769-73.
11. Madhavan S, Nayak M, Shenoy A, Shetty R, Prasad K. Dentinal hypersensitivity: A comparative clinical evaluation of CPP-ACP F, sodium fluoride, propolis, and placebo. *J Conserv Dent*. 2012;15:315-8.
12. Sharma S, Shetty NJ, Up poor A. Evaluation of the clinical efficacy of potassium nitrate desensitizing mouth

wash and a tooth paste in the treatment of dentinal hypersensitivity. J Clin Exp Dent. 2012;4:e28-33.

Legend Tables

Table 1: Comparison of tactile sensitivity in two groups of study subjects

Sn.	Time and groups	Mean	p-value
1	Baseline		
a.	Test group	2.45±0.26	0.15
b.	Control group	2.55±0.25	
2	After desensitizer application		
a.	Test group	1.88±0.01	<0.01
b.	Control group	2.19±0.32	
3	1 months after desensitizer use		
a.	Test group	1.07±0.40	<0.01
b.	Control group	1.37±0.32	
4	1 months after stopping desensitizer use		
a.	Test group	1.04±0.42	<0.01
b.	Control group	1.57±0.46	

Table 2: Comparison of air blast sensitivity in two groups of study subjects

Sn.	Time and groups	Mean	p-value
1.	Baseline		
a.	Test group	7.32±0.39	<0.01
b.	Control group	7.64±0.49	
2.	After desensitizer application		
a.	Test group	6.36±0.37	<0.01
b.	Control group	6.91±0.62	
3.	1 Months after desensitizer use		
a.	Test group	4.95±0.59	<0.01
b.	Control group	5.78±0.59	
4.	1 Months after stopping desensitizer use		
a.	Test group	4.83±0.57	<0.01
b.	Control group	6.06±0.65	