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Dental Science

COMPARISON OF VARIOUS DESENSITIZING TOOTHPASTE – A CLINICAL STUDY

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ABSTRACT

BACKGROUND: Dentine hypersensitivity is a commonly encountered problem that is triggered by an external stimuli. Various treatment modalities have been proposed, amongst them desensitizing paste is used extensively.

OBJECTIVE: Main objective of the study was to compare the efficacy of three commercially available desensitizing tooth paste-Sequel F (R),Hiora k (RVantej(R).

MATERIALS AND METHODS: 30 subjects of dentin hypersensitivity were randomly selected and divided into 3 groups ,desensitizing pastes were prescribed. Baseline values were recorded by tactile method and air blast test using visual analogue scale rating from 0-10. Efficacy was compared on baseline, 10 days and after 30 days.

STATISTICAL ANALYSIS: Wilcoxon singed rank test and Kruskall Wallis test was done to compare the efficacy of sensitivity reduction between the three groups and during different time interval (P value was set at 0.05).

RESULTS: Comparison of all the three pastes showed positive results within 30 days but Vantej (R) showed statistically significant changes within 10 days indicating that it had rapid action.

CONCLUSION: All the tooth paste have convincing evidence in reducing dentinal hypersensitivity. Long term studies to facilitate better understanding can be advocated in the future.

KEYWORDS : Dentinal Hypersensitivity, Tooth Paste, Periodontal Therapy, Visual Analogue Scale, Hydrodynamic Theory.

INTRODUCTION:

Dentinal hypersensitivity is characterized by short sharp pain arising from exposed dentin in response to thermal, evaporative, tactile, osmotic or chemical stimuli. Canadian Advisory Board in 2003 suggested that Dentinal Hypersensitivity should be substituted for pathological condition and thus Dentin hypersensitivity can be identified as a distinct clinical entity[1]. Dentinal hypersensitivity is a painful clinical condition that affects 8-57% of adult population which is majorly associated with dentin exposure to the oral environment[2,3]. Several studies have reported non-carious lesions and dentine hypersensitivity in adult population with prevalence rates ranging from 5-85% [4]and 2-8 % to 74% [5].These variations in percentages are due to differences in populations habits ,dietaries and methods of investigations. The disease is prevalent with the age range of 20-50 years with higher prevalence for females[1, 6,7]. It is manifested in a manner that is physically and psychologically uncomfortable for the patient .Dentin exposure may result from various causes like excessive tooth brushing, exposure of non-bacterial acids in diet, periodontal therapy, and excessive occlusal force leading to tooth wear. The most widely accepted theory for dentinal hypersensitivity is hydrodynamic theory proposed by Brannstrom[8]. Clinical management of dentinal hypersensitivity is based on proper diagnosis, severity of condition, whether localized or generalized, eliminating the possible etiological causes, patient counselling about oral hygiene practices, diet and harmful habits.

There are two common methods to determine the intensity of dentine hypersensitivity one of them is through questionnaire and other is through clinical examination. The prevalence distribution of dentine hypersensitivity in the first method is estimated higher than the second method. The severity or degree of pain can be quantified using visual analogue scale or categorized scale (slight, moderate and severe). Another commonly used method is the "Schiff" scale [9].It has been observed that some people with dentine hypersensitivity do not pursue treatment of the disease as they do not consider dentine hypersensitivity as a specific disease. However they seek professional help when the intensity of pain is severe and affect their daily activity. Various strategies have been developed to treat dentin hypersensitivity. Desensitizing methods aim to control hydrodynamic mechanisms of pain which can be broadly divided into three categories:

1) Agents or products that reduce fluid flow within dentinal tubules themselves thereby blocking the tubules. eg. hydroxyapatite, calcium sodium phoshoshosilicate.[10,11]
2) Those that interupt the neural response to stimuli eg. potassium nitrate[12,13,14,15,16]
3) Coagulation and protein precipitation of plasma in the dentinal fluild eg. Lasers[1]

However, there is no gold standard for treatment of Dentinal hypersensitivity.Hence the objective of the study was to determine the efficiency of three different desensitizing paste Sequel F® (5 %potassium nitrate and sodium monofluorophoshate 0.7% and triclosan 0.3%) Hiora –K (R) (palakya 10 mg, Triphala 6 mg, Trikatu 4mg), Vantej(R)(Novamin glass particle containing Calicum sodium phoshosilicate with 25% sodium,25% Calcium, 6-8 % phosphate and remainder silica).

MATERIALS AND METHOD –

The present study was randomised control single blind conducted at outpatient department of A.J Institute of dental Sciences. A total of 30 patients (18 male and 12 female) who visited the department participated in the study. Informed consent was obtained from each patient. They were randomly divided into 3 groups –Group A - Sequel F(R), Group B - Hiora(R) and Group C - Vantej(R).

INCLUSION CRITERIA-

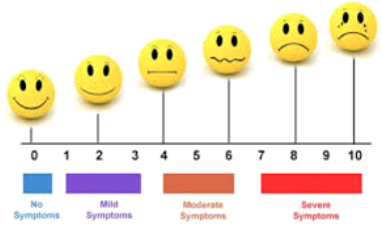
- Patients with generally good health with minimum of two hypersensitive teeth with cervical abrasion
- Gingival recession less than 1mm loss of dentine in depth which did not require any restoration or treatment ,
- Compliant patients.

EXCLUSION CRITERIA:

- Advanced periodontal disease, gross carious lesions, mobility.
- Gross oral pathology
- Medical condition, pregnant or lactating women and
- Patient using other desensitizing toothpaste were excluded from the study.

Baseline sensitivity values were recorded before starting the treatment by tactile method and air blast test using visual analogue scale which was repeated after 10 and 30 days. Tactile sensitivity test was assessed using probe with slight manual pressure in mesio-distal direction on hypersensitive areas of tooth. Sensitivity was also assessed by air blast method where the evaporative stimuli was applied in the form of cold air from a dental unit syringe (at 20 ˚± 3˚C at 40 to 65 psi)for 1sec from a distance of 1 cm from the affected area. The degree of hypersensitivity was recorded according to VAS. The Scores were given on 10 cm sensitivity VAS which has ratings from:

0-1: no pain
2-3: mild pain
4-6: moderate pain
7-10: severe pain.



Subjects >/5 on VAS were included in the study. The effectiveness of two times application of desensitizing paste for period of 30 days among the subjects were analysed.

RESULTS:

Wilcoxon signed rank test and Kruskall Wallis test was done to compare the efficacy of sensitivity reduction between the three groups and during different time interval. (P value was set at 0.05).

There was no report of any side effects on usage of either of the dentifrices.

In the present study, highly significant reduction of both objective and subjective symptoms was observed from baseline to 30 days (Table A and Table B)

Table A

Paramenter: Objective assessment

Group		N	Median	IQR	Minimum	Maximum	Friedman test Value	p value
Group A	DAY 0	10	3.00	(2-3)	1	3	16.545	.000
	10 DAYS	10	1.50	(1-2.25)	0	3		HS
	30 DAY	10	1.00	(0.75-1)	0	2		
Group B	DAY 0	10	2.00	(2-2)	2	3	14.000	.001
	10 DAYS	10	2.00	(1-2)	1	2		HS
	30 DAY	10	1.00	(1-1)	1	2		
Group C	DAY 0	10	2.00	(1.75-2.25)	1	3	12.000	.002
	10 DAYS	10	1.00	(0-2)	0	2		HS
	30 DAY	10	1.00	(0-2)	0	2		

Table B

Paramenter: Subjective assessment

Group		N	Median	IQR	Minimum	Maximum	Friedman test Value	p value
Group A	DAY 0	10	2.50	(2-3)	1	3	15.548	.000
	10 DAYS	10	2.00	(1-2)	1	2		HS
	30 DAY	10	1.00	(1-1)	0	2		
Group B	DAY 0	10	2.00	(2-2)	1	3	12.000	.002
	10 DAYS	10	1.50	(1-2)	1	2		HS
	30 DAY	10	1.00	(1-1)	1	2		
Group C	DAY 0	10	2.00	(2-3)	1	3	13.130	.001
	10 DAYS	10	1.00	(0.75-2)	0	2		HS
	30 DAY	10	1.00	(0-2)	0	2		

PAIR WISE COMPARISON OF OBJECTIVE ASSESSMENT WAS DONE BY WILCOXON SIGNED RANK TEST (TABLE C)

- During 0-10 days significant reduction was noted in all the 3 groups.
- In 10-30 days significant reduction was noted only with group A and group B and no statistically significant changes with group C.
- During 0-30 days statistically highly significant reduction was noted with group A and group B and group C showed significant reduction

Table C

Pairwise comparison by Wilcoxon signed rank test

Paramenter: Objective assessment

	10 DAYS - DAY 0		30 DAY - DAY 0		30 DAY - 10 DAYS	
Group	p value		p value		p value	
Group A	.011	sig	.004	HS	.020	sig
Group B	.025	sig	.004	HS	.025	sig
Group C	.024	sig	.024	sig	1.000	

PAIR WISE COMPARISON OF SUBJECTIVE ASSESSMENT WAS DONE BY WILCOXON SIGNED RANK TEST (TABLE D)

- In 0 -10 days highly significant changes were noted with group A and statistically significant changes were noted with group C and no statistically significant changes was noted with group B.
- In 10-30 days' time period significant reduction was noted with group A and group B and no significant changes with group C.
- 0-30 days highly significant changes were noted in group A and group B and significant changes in group C.

Table D

Pairwise comparison by Wilcoxon signed rank test

Paramenter: Subjective assessment

	10 DAYS - DAY 0		30 DAY - DAY 0		30 DAY - 10 DAYS	
Group	p value		p value		p value	
Group A	.008	HS	.006	HS	.020	sig
Group B	.059		.007	HS	.046	sig
Group C	.014	sig	.016	sig	.157	

However according to the results of this study no statistically significant difference was seen within the 3 groups at 0 day,10 day and 30 days(Table E and Table F-Krushall Wallis test)

GROUP WISE COMPARISON BY KRUSHALL WALLIS TEST

Table E

Paramenter: Subjective assessment

	Group	N	Median	IQR	Minimum	Maximum	Kruskall wallis test	p value
DAY 0	Group A	10	2.50	(2-3)	1	3	2.486	.289
	Group B	10	2.00	(2-2)	1	3		NS
	Group C	10	2.00	(2-3)	1	3		
10 DAYS	Group A	10	2.00	(1-2)	1	2	2.578	.276
	Group B	10	1.50	(1-2)	1	2		NS
	Group C	10	1.00	(0.75-2)	0	2		
30 DAY	Group A	10	1.00	(1-1)	0	2	.191	.909
	Group B	10	1.00	(1-1)	1	2		NS
	Group C	10	1.00	(0-2)	0	2		

Table F

Paramenter: Objective assessment

	Group	N	Median	IQR	Minimum	Maximum	Kruskall wallis test	p value
DAY 0	Group A	10	3.00	(2-3)	1	3	4.243	.120
	Group B	10	2.00	(2-2)	2	3		NS
	Group C	10	2.00	(1.75-2.25)	1	3		
10 DAYS	Group A	10	1.50	(1-2.25)	0	3	1.956	.376
	Group B	10	2.00	(1-2)	1	2		NS
	Group C	10	1.00	(0-2)	0	2		
30 DAY	Group A	10	1.00	(0.75-1)	0	2	.720	.698
	Group B	10	1.00	(1-1)	1	2		NS
	Group C	10	1.00	(0-2)	0	2		

DISCUSSION:

Dentin hypersensitivity is a common clinical condition in permanent teeth characterized by an exaggerated response to non-noxious stimuli. It is mainly caused by loss of enamel or cementum leading to the exposure of dentine to the oral environment[18].There have been various materials and methods proposed to reduce and treat dentinal hypersensitivity. These include the uses of dentrifices , composites, lasers ,bioglass and so on.

The desensitizing tooth paste is one of the most commonly and widely used method for dentinal hypersensitivity because of its low cost ,ease of use and application. These materials usually exert their effect through sealing the dentinal tubules thereby reducing the transmission of nerve impulse.

Thus the goal of the study was to determine the efficacy of three desensitizing tooth paste -Sequel F® ,Hiora K®, Vantej(R).

The potassium nitrate present in Sequel F® inhibits repolarisation of sensory nerve endings thereby reducing pain[19]. According to Wilchgers and Ermert and Kim potassium nitrate has an effective desensitizing action. It is believed that the increase in the concentration of extracellular potassium around the nerve fibres causes their depolarization, avoids repolarisation and blocks the axonic action and passage of nerve stimulus, thus inactivating the action potential[20]. Markowitz K and Kim also stated that a prolonged period of depolarization results in inactivation of action potential thus divalent cation solution stabilize the nerve membrane without changing the membrane potential[21]. Shreya et al stated that subjects treated with 5% potassium nitrate in the present study showed significant improvement in hypersensitivity scores thus claimed the efficacy of the agent in reducing hypersensitivity[22]. In this present study, thereby significant reduction of symptoms with Sequel F(R) from baseline to 30 days. Hiora K(R) contains herbs which act on the tooth and have protective and antimicrobial action. Present study showed significant efficacy of Hiora K(R) toothpaste in sensitivity reduction as there was remarkable symptomatic relief noted in all the patients. A study conducted by Sukumaran et al stated that Hiora-K(R) was safe and it effectively reduced dentinal hypersensitivity[23]. Novamin is a bioactive glass/ceramic with calcium sodium phoshosilicate as an active ingredient which works on the principle of tubule occlusion by infiltration of precipitation products which when exposed to aqueous media provides calcium and phosphate ions that form HCA with time. Combination of HCA layer results in physical occlusion of dentinal tubules which relives hypersensitivity[24].A review of literature by Gendreav et al based on randomized controlled clinical trials, support the use of novamin tooth paste formulation in providing relief of pain from dentinal hypersensitivity[25].

A comparative study by Parkinson and Wilson concluded that calcium sodium phosphosilicate imparts significant level of dentinal occlusion thus with durable occlusive deposits following 4 days of twice daily brushing in vitro[26]. A study conducted by Aditya et al stated that novamin crystals have been highly effective in treatment of dentine hypersensitivity pain [27]. Narong dij et al stated that calcium sodium phosphosilicate tooth paste showed a greater benefits at an early stage compare to potassium nitrate[28]. Results with Vantej(R) in the present study also revealed that statistically significant changes were noted from 0-10 days indicating that it had a rapid action .In our study, the comparsion of all the three toothpastes showed positive results within 30 days. However the placebo effect should be taken into consideration while comparing between the desensitizing agents because of the individual variability in pain response in dentinal hypersensitivity studies we need to include large sample size to get statistically significant results[29].The formation of reparative dentin may also attribute to the occlusion of dentinal tubules and reduction of sensitivity with time. All these factors must be considered while analysing the results.

CONCLUSION:

All the toothpastes have convincing and supporting evidence for efficacy in reducing dentinal hypersensitivity. Long term studies to facilitate better understanding of performance of these desensitizing toothpaste can be advocated in the future. Inclusion of a placebo group to determine whether the results were due to placebo effect might be beneficial.

REFERENCES:

1. Canadian Advisory Board on Dentinal Hypersensitivity (2003); Consensus based recommendations for diagnosis and management of dentin Hypersensitivity. J Can Dent Assoc 69:221-226.
2. Markowitz K,Pashley DH(2007);Personal reflections on a sensitive subject. J Dent Res 86,292 -295.
3. Addy M,,Embery WM,Orchardson Reds,Martin Dunitz.Dentine hypersensitivity ;definition ,prevalence,distribution and etiology.In :Tooth wear and sensitivity.Clinical advances in restorative dentistry.2000;239-248.
4. Barldt DW,Shaw P.A ;Critical review of non carious cervical (wear) lesions and the role of abfraction, erosion and abrasion. J Dent Res 2006 86:306-312.
5. Que K, Guo B, Jia Z, Chen Z, Yang J, Gao P.;A cross-sectional study: non-carious cervical lesions, cervical dentine hypersensitivity and related risk factors. J Oral Rehabil. 2013(40)24–32.
6. Arhana AC,Pimenta LA,Marchi GM;Clinical evulation of desensitizing treatment for cervical dentin hypersensitivity. Braz.Oral.Res.2009(23): 333-339.
7. Chuch Lo ;ECM Dentin Hypersensitivity:a review Hong Kong Dent J 2010;(7)15-22.
8. Brannstrom MA.;Hydrodynamic mechanism in the transmission of pain producing stimuli through the dentine. Sensory Mechanism in Dentine. 1st ed. Oxford: Pergamon Press; 1962. p. 73-9.
9. Schiff T,Dotson M.Cohen S,De vizio W,McCool J,Volpe ;A.Efficacy of a dentrifice containing potassium nitrate,soluble pyrophosphate,PVM/MA copolymer ,and sodium fluride on dentinal hypersensitivity:A twelve week clinical study. J Clin Dent 1994;5:87-92.
10. Zhong JP,Greenspan DC,Feng JW;A microstructural examination of apatite induced by bioglass in vitro. J Mater Sci Mater Med.2002;(13):321-6
11. Salian S,Thakur S,Klkarni S,LaTorre G.A; Randomized controlled clinical study evaluating the efficacy of two desensitizing dentrifices. J Clin Dent 2010 ;(21):82-7.
12. Tarbet WJ,Buckner A,Stark MM ,Fratarcangelo PA, Augsburger R; The pulpal effects of brushing with a 5 percent potassium nitrate toothpaste used for desensitization .Oral Surg Oral MedOralPath 1981 Jun ;51(6):600-602.
13. Knight NN,Lie T,Clark SM, Adams DF;Hypersensitive dentin:testing of procedures for mechanical and chemical obliteration of dentinal tubuli. J Periodontol.1993 May ;64(5):366-73.
14. Poulsen S,Errboe M,Lescay MY,Glenny A.M;Potassium containing toothpastes for dentine hypersensitivity, Cochrane Database Syst Rev .2006 Jul 19;(3):CD001476.
15. Nagata T,Ishida H,Shinohara H , Kasahara S, Wakano Y, Daigen S, Troullos ES;Clinical evulation of a potassium nitrate dentrifice for the treatment of dentinal hypersensitivity. J Clin Periodontol.1994 Mar;21(3)217-21.
16. Schiff T,Dotson M,CohenS, De Vizio W, Mc Cool J, Volpe A ;Efficacy of a dentrifice containing potassium nitrate, soluble pyrophosphate, PVM/MA copolymer,and sodium fluoride on dentinal hypersensitivity: a twelve –week clinical study. J Clin dent.1994;5 Spec No:87-92.
17. Asnaashari M, Moeini M;Effectiveness of laser in the treatment of dentin hypersensitivity .J Lasers Med Sci 2013;4(1):1-7.
18. Isabel ,Andrade,Marcos; Diagnosis and treatment of dentinal hypersensitivity. J Oral Sci 2009;51(3)323-332.
19. Walter PA;Dentinal hypersensitivity :A Review.The J Contemp Dent Pract 2005;6(2)107-117.
20. Kim S (1986)Hypersensitive teeth:desensitization of pulpal sensory nerves.J Endod 12,482-485.
21. Markowitz K,kim S; The role of selected cations in the desensitization of intradental nerves.Proc Finn Dent Soc 1992;88(suppl 1):39-54
22. Shreya S, Ramesh K, Ram reddy Y, Karunakar S (2013); Comparative Evaluation of Hydroxyapatite, Potassium Nitrate and Sodium Monofluorophosphate as in Office Desensitising Agents–A Double Blinded Randomized Controlled Clinical Trial. Oral Hyg Health l: 104.
23. Sukumaran V.G,Vivekanandhan P,Amutha D;An Open clinical study to evulate the efficacy and safety of Hiora-K toothpaste in the management of sensitive tooth.The Antiseptic.August 2010;(107)379-382.
24. Rajesh KS,Hedge S,Arun Kumar Ms,Shetty DG;Evulation of efficicacy of 5% calicium sodium phoshosilicate (Novamin) containing dentrifice for relief of dentinal hypersensitivity: a clinical study. Indian J Dent Res 2012(23)363-7.
25. Gendreau L , Barlow AP, Mason SC; Overview of the clinical evidence for the use of NovaMin in providing relief from the pain of dentin hypersensitivity. J Clin Dent.2011(22)90-5.
26. Parkinson CR,Willson RJ;A comparative in vitro study investigating the occlusion and mineralization properties of commercial tooth pastes in a four day dentin disc model.J Clin Dent.2011(22)74-81.
27. Rao A,Mitra D,Prabhakar AK,Soni S,Ahmed S;The reduction of efficacy of dentinal hypersensitivity by two commercially available desensitizing toothpastes:Vantej and Colgate Pro- Argin.Saudi Emdod J 2014(4)7-12.
28. Narongdej T, Sakoolnamarka, Boonroung T. The effectiveness of a calcium sodium phosphosilicate desensitizer in reducing cervical dentin hypersensitivity : a pilot study .J Am Dent Assoc.2010(141)995-9.
29. Morris MF,Davis RD,Richardson BW;Clinical efficacy of two desensitizing agents. Am J Dent 1999(12)72-6.