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Comparative Evaluation of Effectiveness of Two Desensitizing Agents in the Treatment of Dentin Hypersensitivity: In-Vivo Study

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Abstract

Aim: The aim of this in-vivo study was to clinically evaluate the effectiveness of two agents- GC Tooth Mousse and Hiora K in the treatment of dentin hypersensitivity.

Materials And Methods: This in-vivo double blind study was done among 40 patients who visited the Department of Conservative Dentistry and Endodontics at Hitkarini Dental College and Hospital; Jabalpur .Two Groups were randomly selected in this double blinded study. The investigator and the participants were not aware of the assigned groups. The two groups selected are those treated with GC tooth mousse and Hiora -K. Patients were instructed to use the respective agent twice daily at home and then, after 1-week and after 3 weeks scores of tactile and air-blast examinations were performed and recorded by the same examiner. Sensitivity was assessed at baseline, immediately after application and after 1-week and 3-weeks. Tactile stimuli response using a visual analog scale and standard cold air blast using Schiff air sensitivity scale were used to compare the efficacies of pastes.

Statistical Analysis: Statistical analysis was done using t test, one way analysis of variance (ANOVA) test and followed by post hoc tukeys test.

Results: A statistically significant difference in VAS score and SCA score between the tested groups Hiora K and GC tooth mouse was seen in 1 week and 3 weeks

. There was a reduction of dentin hypersensitivity in VAS score and SCA score in both groups when baseline values were compared with immediate, 1-week and 3 weeks postoperative scores. GC tooth mousse was significantly better than Hiora K at 3 weeks intervals.

Conclusion: Under the limitation of the present study, it can be concluded that GC tooth mousse is more effective as compared to Hiora K after 3 weeks interval. Both GC Tooth Mousse and Hiora K showed a significant reduction in dentin hypersensitivity in all time intervals.

Keywords: Dentin hypersensitivity; CPP-ACP; Potassium nitrate.

Introduction

Dentin hypersensitivity is one of the most commonly experienced clinical problem and is characterized by short, sharp pain arising from exposed dentin in response to stimuli, such as thermal, evaporative, tactile, osmotic or chemical, and which cannot be ascribed to any other dental disease or defect. [1]

Currently, two main methods are used in the treatment of dentin hypersensitivity are tubular occlusion that is mechanical occlusion of dentinal tubules by physical and chemical agents and blockage of nerve activity. This blockage of nerve activity can be achieved through ionic diffusion or by increasing the potassium ion concentration around the nerve fibers causes reduction in dentin hypersensitivity. [2]

Various desensitizing agents are available which are classified on the basis of mode of administration such as in office administrations and at home administrations. They further classified on the basis of method of treatment and that includes nerve desensitization, protein precipitation, plugging dentinal tubules, dentin adhesive Sealers, lasers, homeopathic medications.[3]

Prof Reynolds at University of Melbourne developed GC tooth mousse in 1998. It contains amorphous calcium phosphate and casein phospho-peptide obtained from milk casein. Casein Phospho- Peptide forms nano complexes with amorphous calcium phosphate at the tooth surface, thereby providing a reservoir of calcium and phosphate ions which favors the mineralization .[4, 5] It remarkably decrease the dentine permeability by creating precipitates on the dentine surface and, thus it causes reduction in the diameter of dentinal tubules thereby reducing the dentinal sensitivity.[6]

Hiora-K contains herbs which act on the tooth and have protective antimicrobial activities. It contains oil of Syzygium aromaticum, Cinnamomum zeylanicum, and extracts of Spinacia oleracea, Triphala, Trikatu and powders of Yashada bhasma and Surya kshara. Hiora K contain naturally derived potassium nitrate (Suryakshara) as active ingredient.[7] The desensitizing effect of potassium nitrate is due to the increase in concentration of extracellular potassium around the nerve fibres which cause their depolarization, avoids repolarization and blocks the axonic action. This blockage the passage of nerve stimulus and thus, resulting in inactivation of the action potential.[8]

The aim of this in-vivo study was to clinically evaluate the effectiveness of two agents : GC Tooth Mousse and Hiora K in the treatment of dentin hypersensitivity.

Material and Methods

An in-vivo, double blind study was conducted among 40 patients who visited the Department Of Conservative Dentistry & Endodontics at Hitkarini Dental College and Hospital. The randomization process was done using simple random method. To

ensure the examiner remained blind, investigators were neither involved in the randomization process nor were they aware of the assigned group.

Inclusion Criteria

Patients with age group of 25-50 yrs were included in this study. Minimum of two hypersensitive teeth with cervical abrasion or gingival recession were selected and teeth with less than 1mm loss of dentin in depth at the cervical margin were selected for this in vivo study.

Exclusion Criteria

Patients with Gross oral pathology, chronic disease, advanced periodontal disease, or hypersensitive teeth with mobility more than 1 were excluded from the study. Subjects with existing medical conditions, pregnant or lactating women, individuals who used desensitizing dentifrice within the last 3 months, were not allowed to participate in the study and patients allergic to milk (casein) were not included in the study.

Method of Scoring

Baseline sensitivity values were recorded before starting the treatment with the tactile method and air blast stimuli method.

Tactile Senstivity Test : Tactile assessment was done using Visual Analog Scale. Scoring was done using a blunt probe under slight manual pressure in the mesiodistal direction on the hypersensitive areas of the tooth. The degree of hypersensitivity was reported according to Visual Analog Scale. Subjects with baseline values ≥4 on VAS were accepted into the study.

VAS Scoring criteria are 0-1 no pain, 2-3 mild pain, 4-6 moderate pain, 7-10 severe pain.

Air Blast Sensitivity Test: Air blast assessment done Using Schiff's cold sensitivity test. Scoring was done using the air component of a dental air/ water syringe by directing a blast of air perpendicular to exposed dentin onto the buccal surface of the sensitive tooth. Adjacent proximal teeth were shielded from the air blast through the placement of two fingers . A score of 2 or 3 (Schiff Cold Air Sensitivity Scale) were included in the study .

Schiff's cold air sensitivity scoring criteria are 0 - subject did not respont to air stimulus, 1 - subject responded to air stimulus but did not request discontinuation of stimulus, 2- subject responded to air stimulus and requested discontinuation or moved from stimulus, 3 - subject responded to air stimulus considered stimulus to be painful and requested discontinuation of the stimulus.

Groups were randomly selected in this double-blinded study. The investigator and the participants were not aware of the assigned groups . The two groups selected are those treated with GC tooth mousse and Hiora –K.

Method of Application

A pea sized amount of the assigned desensitizing agent was applied and spread to the isolated hypersensitive lesions using disposable micro applicators and then post application immediate scoring was done using tactile and air blast method. Patients were instructed to use the respective agent twice daily at home and then, after 1-week and after 3 weeks scores of tactile and air-blast examinations were performed and recorded by the same examiner.

Statistical Analysis

Statistical analysis was done using t test, One way analysis of variance (ANOVA) test and followed by post hoc tukeys test.

Results

All the 40 subjects completed the 3 weeks of follow up. There were no adverse effects on hard and soft tissues.

Statistical analysis showed a statistically significant difference in VAS score [Table 1] and SCA score

[Table 3] between the tested groups Hiora K and GC tooth mouse in 1 week and 3 weeks intervals.

Result shows a reduction of dentin hypersensitivity in VAS score [Table 2] and SCA score [Table 4] in all groups when baseline values were compared with immediate, 1-week and 3 weeks postoperative scores. Table 4 showed that GC tooth mousse was significantly better than Hiora K at 3 weeks intervals.

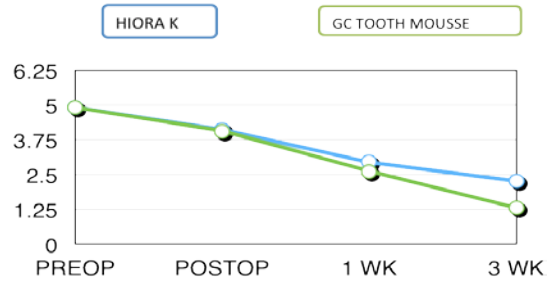
There was a significant decrease of hypersensitivity in VAS score [Graph 1] and Schiff's score [Graph 2] in both the tested groups Hiora K and GC tooth mousse in 1 week and 3 weeks intervals.

TIME INTERVAL	HIORA K		GC TOOTH MOUSSE		t test	significance
	MEAN	SD	MEAN	SD	P VALUE	P<0.05
PRE OPERATIVE	4.926	0.488610274	4.906	0.417386426	0.906273443	
POST OPERATIVE	4.133333333	0.619523627	4.055333333	0.582063652	0.617026478	
1 WEEK	2.954666667	0.613128589	2.616	0.610933712	0.138947712	SIGNIFICANT**
3 WEEKS	2.27	0.535963751	1.296666667	0.594278274	0.000144523	SIGNIFICANT**
					0.000982525	

Table1 : showed a statistically significant difference in VAS score between the tested groups Hiora K and GC tooth mousse in 1 week and 3 weeks intervals.

TIME INTERVAL	HIORA K			GC TOOTH MOUSSE		
	MEAN ± SD	F VALUE	P VALUE	MEAN ± SD	F VALUE	P VALUE
PREOPERATIVE	4.9260 ± 0.4886	63.6132	0.001**	4.906 ± 0.4174	122.7093	0.001**
POST OPERATIVE	4.1333 ± 0.6195			4.0553 ± 0.5821		
1 WEEK	2.9547 ± 0.6131			2.6160 ± 0.6109		
3 WEEKS	2.2536 ± 0.5523			1.2967 ± 0.5943		

Table 2 showed a reduction of dentin hypersensitivity in VAS score in both groups when baseline values were compared with immediate, 1-week and 3 weeks postoperative scores.



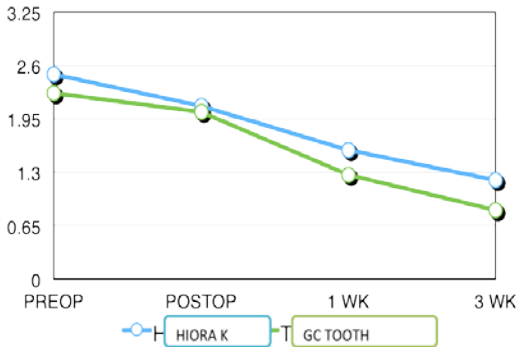
Graph 1: showed a significant decrease of hypersensitivity in VAS score in both the tested groups Hiora K and GC tooth mousse in 1 week and 3 weeks intervals.

TIME INTERVAL	HIORA K	GC TOOTH MOUSSE	t TEST
	Mean ± SD		
PREOPERATIVE	2.49 ± 0.198	2.26 ± 0.359	
POST OPERATIVE	2.10 ± 0.306	2.03 ± 0.248	0.466812952
1 WEEK	1.56 ± 0.247	1.27 ± 0.302	0.01732094*
3 WEEKS	1.20 ± 0.400	0.84 ± 0.257	0.00189012**
	P = 0.000007158**		SIGNIFICANT (P ≤ 0.05)

Table 3: showed a statistically significant difference in Schiff's score between the tested groups Hiora K and GC tooth mousse in 1 week and 4 weeks intervals.

TIME INTERVAL	HIORA K			GC TOOTH MOUSSE		
	MEAN ± SD	F VALUE	P VALUE	MEAN ± SD	F VALUE	P VALUE
PREOPERATIVE	2.4860 ± 0.2038	71.8817	0.001**	2.2660 ± 0.3596	75.398	0.001**
POST OPERATIVE	2.0840 ± 0.3383			2.0353 ± 0.2482		
1 WEEK	1.5640 ± 0.2534			1.2720 ± 0.3028		
3 WEEKS	1.1907 ± 0.2256			0.842 ± 0.2573		

Table 4: showed a significant reduction of hypersensitivity in postoperative scores of Hiora K was better than GC tooth mousse in Schiff's test.



Graph 2: showed a significant decrease of hypersensitivity in Schiff's score in both the tested groups Hiora K and GC tooth mousse in 1 week and 3 weeks intervals.

Discussion

Dentin hypersensitivity is the most common clinical condition usually associated with exposed dentinal surfaces. Various desensitizing agents have been used for the management of dentin hypersensitivity. The ideal goal for any dentine- desensitizing agent is to, at least, minimize and hopefully abolish the symptoms of pain or discomfort associated with dentin hypersensitivity. [9]

For pain assessment, we used more than one stimulus as recommended by Holland et al, which arose from the fact that different stimuli can elicit different pain sensations.[10] by using probe tip as a tactile stimulus, inward movement of dentinal fluid occurs owing to the compression of dentin, the mechanoreceptors causing the painful sensation are activated. Air stimulus decreases the temperature at the dentin surface, causing a rapid outward fluid flow from the opened dentinal tubules, which stimulates the painful sensation.[11]

In the present study, GC Tooth Mousse was found to be more effective in reducing dentin hypersensitivity among the groups. GC tooth mousse contains ACP and CPP. This distinct complex make strong bonding with biofilm on teeth restoring the mineral balance by strengthening the hard tissues and reduces the diameter of dentinal tubules thereby reducing the dentinal sensitivity.[5]

In this study, Hiora K was found to be effective in reducing dentin hypersensitivity. It contains potassium nitrate as active ingredient. Potassium nitrate increases the concentration of extracellular potassium around the nerve fibres and cause their depolarization and inhibits pain in hypersensitive teeth. Hiora K also contains natural oxalate compounds, which helps in forming phytocomplexes on the teeth. This occludes dentinal tubules and blocks the transmission of pain. This natural ingredients in the toothpaste help to form a protective layer on the tooth enamel and plug exposed dentinal tubules.[12]

In a Study conducted by Torwane A .et al , GC Tooth Mousse showed 91.6 % reduction in dentin hypersensitivity. This is in concurrence with the present study, where mean VAS scores reduced from 4.90 to 1.29 and GC tooth mousse was significantly better in reducing the dentinal hypersensitivity at the 3weeks interval.[4]

In the present study, GC Tooth Mousse was found to be effective in reducing dentin hypersensitivity in 3 weeks follow up. Parveen N. et al, also reported similar beneficial effects of Tooth Mousse on reducing dentin hypersensitivity in 4 week follow up.[6]

Walsh L. et al, conducted a study and found that both CPP-ACP crème and potassium nitrate dentrifice gave similar reductions in cervical dentinal sensitivity, however we found that CPP-ACP crème was found to be more effective as compared to potassium nitrate dentrifice.[13]

Darsan J. et al also found that Hiora K toothpaste and mouthwash occluded the dentinal tubules, thereby, useful for the treatment of dentinal hypersensitivity .[14]

ACP was developed by Tung et al in 2003 as it mimics the natural process of dentinal sclerosis and provides effective biocompatible treatment for dentin hypersensitivity.[15]

Casein Phospho Peptide –Amorphous Calcium Phosphate has provided a new arena to preventive dentistry. It has shown anticariogenic, anti-erosive efficiency and reduces dentine hypersensitivity. Based on the findings of the present study, long term effects of GC Tooth Mousse are found to be more promising than Hiora-K.

Conclusion

Under the limitation of the present study, it can be concluded that GC tooth mousse is more effective as compared to Hiora K after 3 weeks interval. Both GC Tooth Mousse and Hiora K showed a significant reduction in dentin hypersensitivity in all time intervals.

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