

EFFICACY OF AMORPHOUS CALCIUM PHOSPHATE, G.C. TOOTH MOUSSE AND GLUMA DESENSITIZER IN TREATING DENTIN HYPERSENSITIVITY : A RANDOMIZED CLINICAL TRIAL

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ABSTRACT:

Background: The traditional approach for treating hypersensitive dentin is based on the hydrodynamic mechanism. **Aims:** To evaluate the effectiveness of three agents in treating dentinal hypersensitivity associated with non-carious, non-restorable cervical lesions.

Material and Methods: Twelve patients presenting with cervical hypersensitivity were randomly enrolled for the study. The lesions were divided into three treatment groups namely amorphous calcium phosphate (ACP) group, G.C. tooth mousse group and gluma desensitizer group. Sensitivity was assessed by tactile and thermal tests and measured with a visual analogue scale.

Results: G.C. tooth mousse and gluma desensitizer caused greater reduction in sensitivity when compared to ACP. A partial reversal of hypersensitivity was observed with the ACP group.

Conclusion: Tooth mousse and gluma desensitizer showed a rapid and sustained desensitizing action and were effective in reducing cervical dentinal sensitivity.

Key words: Amorphous calcium phosphate, G.C. tooth mousse, gluma desensitizer.

INTRODUCTION:

Since the dawn of history, tooth wear has proved to be a fascination to mankind. The principal reason is that while other parts of the body repair themselves to a certain degree, the hard structures of the teeth are incapable of repair and any life

events affecting the developing or erupted teeth will be recorded in the dentition and are capable of being analyzed and interpreted.^[1]

Dental wear is commonly classified as abrasion, erosion and attrition. Dentin hypersensitivity is the clinical outcome of

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this phenomenon.^[2] Tooth hypersensitivity is an exaggerated response to a non-noxious sensory stimulus.

Prevention or relief of pain of hypersensitive dentin can be accomplished by; a) sealing the pulpal end of tubules, usually by stimulating the formation of secondary dentin, b) coagulating the tubular protoplasm by chemical treatment, c) providing chemical ions which precipitate the protoplasmic fluid in the tubules, d) sealing the outer ends of dentinal tubules.

Gluma Desensitizer (Kulzer) is a commercial preparation containing 5% glutaraldehyde and 35% Hydroxyethyl methacrylate and is used as a simple, one-step chair-side procedure for treating and preventing dentinal hypersensitivity.^[3]

The search for a natural desensitizing agent with long-lasting effects has led to the observation that calcium phosphate minerals obstruct dentinal tubule orifices mimicking the natural process of sclerosis. This could be achieved on the tooth surface by sequential application of calcium chloride and potassium phosphate solutions which form amorphous calcium phosphate (ACP) and block the dentinal tubules.^[4]

G.C. tooth mousse is a commercial preparation containing ACP and casein phosphopeptide (CPP). The ACP-CPP combination localizes in plaque in the form of Nano clusters and causes remineralization of enamel at a much faster rate than seen with ACP alone. This

study evaluates the desensitizing effect of ACP, G.C tooth mousse and gluma desensitizer on dentinal hypersensitivity.

MATERIAL AND METHODS:

Twelve Adult patients between 20-50 years of age, presenting with the chief complaint of dentin hypersensitivity in the out-patient department of Public Health Department, Jaipur Dental College were examined for sensitive lesions.

Inclusion Criteria:

Patients with a minimum of two sensitive lesions each in any three quadrants were selected for the study. The loss of dentin had to be less than 0.5mm in depth which did not require any restorative regimen.

Exclusion Criteria:

Teeth with erosion, attrition, caries, cracks, restorations or pulpitis were excluded from the study. A detailed case history was taken and two sensitive lesions each from three quadrants were identified and the quadrants grouped as follows.

Group I: The lesions were treated with ACP which is applied thrice on 1st, 7th and 28th day.

Group II: The lesions were treated with G.C. Tooth Mousse following the manufacturer's instructions.

Group III: The lesions were treated with a single application of Gluma Desensitizer following the manufacturer's instructions.

Materials:

1) Fresh solutions of 1.5 mol/l calcium chloride and 1.0 mol/l aqueous potassium phosphate.

2) G.C. tooth mousse (G.C. Corporation).

3) Gluma Desensitizer (Kulzer).

Baseline sensitivity values were recorded before starting the treatment on the visual analogue scale [VAS].

Procedure:

Group I (ACP group): Fresh solutions of 1.5 mol/l calcium chloride and 1 mol/l of potassium phosphate were prepared. Calcium chloride solution was applied to the isolated sensitive lesions using a cotton pellet saturated with the solution and rubbed on the surface for 5 seconds followed by an application of potassium phosphate solution. The patients were asked not to rinse, eat or drink for 30 minutes after the treatment. A total of three applications were carried out.

Group II (G.C. Tooth Mousse group): A generous layer of G.C. Tooth Mousse was applied on the teeth surfaces according to manufacturer's instructions.

Group III (Gluma Desensitizer group): The smallest amount of Gluma Desensitizer was applied to the dentin using pellets or brushes and left for 30-60 seconds making sure that it contacts only the area to be treated. The surface was dried carefully with a stream of air until the fluid disappeared and the surface was no longer shiny and then rinsed thoroughly

with water. A single application of Gluma Desensitizer was carried out.

The sensitivity tests were the tactile and thermal (water at room temp, 15 ° C and 45 ° C) tests. Sensitivity values were recorded on the VAS where the patients were asked to define the degree of sensitivity by placing a vertical mark on a 10 cm horizontal line where "0" was no pain and "10" was severe pain.

RESULTS:

The results were analyzed using 2 way analysis of variance (ANOVA) with repeated measures of time and treatment as primary variables. Statistical analysis showed significant reduction in dentin hypersensitivity when baseline VAS scores were compared to post treatment scores at 2, 4 and 6 month (Table 1)

Results revealed that lesions in Group II i.e. G.C. Tooth Mousse group and Group III i.e. Gluma Desensitizer group showed 100% relief from sensitivity 6 months after treatment when the sensitivity was evaluated by using water at 45°C and water at room temperature. However when tactile stimulus was used to evaluate sensitivity, there was 88% reduction in sensitivity in lesions belonging to group II and 72% reduction in lesions belonging to group III. When water at 15°C was used to evaluate sensitivity, there was 85% reduction in sensitivity in teeth belonging to group II and 87% reduction in sensitivity in teeth belonging to group III during the 6th month evaluation. The clinical performances of G.C. Tooth Mousse and Gluma Desensitizer were similar.

Table 1 Comparison of VAS scores												
Time of assessment	Group- I				Group – II				Group – III			
	Mean SD	Diff from baseline	%	Sig	Mean SD	Diff from baseline	%	Sig	Mean SD	Diff from baseline	%	Sig
Baseline	6.2±1.6	-	-	-	6.0±1.7	-	-	-	6.2±1.8	-	-	-
2 mon	1.4±1.0	4.8	77	<0.001	0.7±1.1	5.3	88	<0.001	0.9±1.1	5.3	86	<0.001
4 mon	1.3±0.7	4.9	79%	<0.001	0.7±0.7	5.3	88	<0.001	0.6±0.6	5.6	90	<0.001
6 mon	1.5±1.9	4.7	76%	<0.001	0.9±0.7	5.1	85	<0.001	0.8±0.7	5.4	87	<0.001
Anova	F=58.9 P<0.001				F = 62.0 P<0.001				F = 65.6 P<0.001			

ACP caused a 60% reduction in tactile sensitivity, 72% reduction in sensitivity to water at 45°C temperature, 55% reduction in sensitivity to water at room temperature and 76% reduction in sensitivity to water at 15°C. It has shown maximum desensitizing action at the 2nd month evaluation period after which the desensitizing effect has gradually reduced.

DISCUSSION:

ACP was developed by Tung et al in 2003(4) as it mimics the natural process of dentinal sclerosis and provides effective biocompatible treatment for dentin hypersensitivity. ACP is precipitated under oral physiological conditions by the sequential application of calcium chloride (1.5mol/l) solution followed by potassium phosphate (1mol/l) maintained at a pH of 9.5.

G.C. Tooth Mousse was developed by Prof Reynolds at the University of Melbourne in 1998.(5) It contains CPP and ACP. CPP stabilizes ACP and forms nano complexes with ACP at the tooth surface thereby providing a reservoir of calcium and phosphate ions which favors mineralization. CPP also buffers the Ph of plaque, depresses demineralization and enhances remineralization which also results in the anticariogenic property of CPP-ACP.^[6]

Gluma Desensitizer contains hydroxyethyl-methacrylate (HEMA) with glutaraldehyde resulting in its desensitizing effect by precipitation of plasma proteins in the dentinal tubules which reduces dentinal permeability and occludes the peripheral tubules.^[3] The presence of glutaraldehyde causes

irreversible stiffening of collagen, inhibits dentin demineralization thus preventing caries development and also imparts an antibacterial effect to Gluma Desensitizer. It has proved to be superior desensitizing agent and results of this study are similar to the results of similar studies carried out earlier.^[7,8]

The stimuli used to evaluate sensitivity were tactile evaluation (where an explorer is passed over the sensitive lesion), and thermal evaluation i.e. response to water at water at room temperature and 15°C and 45°C, as thermal tests and cold test in particular have a good correlation to the hypersensitivity symptoms encountered in daily life. The temperatures of 45°C and 15°C had been selected as these were the temperatures at which food and beverages were likely to be frequently consumed. Results at 2nd, 4th and 6th month evaluation periods showed that while all three materials were effective in reducing sensitivity, G.C. tooth mousse and Gluma Desensitizer were clearly superior to ACP.

G.C. Tooth Mousse and Gluma Desensitizer have not only shown a rapid reduction in sensitivity, they have also shown a prolonged desensitizing action and patient satisfaction was highest with

REFERENCES:

1. Pashley DH. Dentin permeability: theory and practice. *Experimental Endodontics* 1990;19–49.
2. Addy M, Embery G, Edgar M, Orchardson R. *Tooth wear and sensitivity*. London, Martin Dunitz 2000.

both these agents as seen with earlier studies. This effect can be attributed to the mechanism of action of these agents.

Successful management of dentin hypersensitivity requires more research into factors such as diet, lifestyle and salivary flow/content. Correcting the factors which have led to sensitivity in the first place alone can prevent recurrence. It is desirable to develop novel agents that are capable of more effective and lasting tubule occlusion such as methods that mimic or harness the natural defense reactions of the dentin-pulp complex.

CONCLUSION:

All three agents, i.e. ACP, G.C. tooth mousse and Gluma desensitizer rapidly and effectively reduced dentin hypersensitivity. It can be concluded that G.C. tooth mousse and Gluma desensitizer have a more lasting desensitizing effect when compared to ACP. Whereas Gluma Desensitizer achieved its desensitizing action in a single application, multiple applications were required for G.C. Tooth Mousse in reducing sensitivity.

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3. Schüpbach P, Lutz F, Finger W. Closing of dentinal tubules by Gluma desensitizer. *European Journal of Oral Sciences* 1997;105(5):414-21.
4. Geiger S, Matalon S, Blasbalg J, Tung M, Eichmiller F. The clinical effect of amorphous calcium phosphate (ACP)

- on root surface hypersensitivity. Operative Dentistry 2003; 28 (5): 496-500.
5. Shen P, Cai F, Nowicki A, Vincent J, Reynolds E. Remineralization of enamel subsurface lesions by sugar-free chewing gum containing casein phosphopeptide-amorphous calcium phosphate. *Journal of Dental Research* 2001; 80(12):2066-70.
 6. Reynolds E, Cain C, Webber E, Black C, Riley P, Johnson I, Perich J. Anticariogenicity of calcium phosphate complexes of tryptic casein phosphopeptides in the rat. *Journal of Dental Research* 1995; 74(6):1272-9.
 7. Jain P, Reinhardt J, Krell K. Effect of dentin desensitizers and dentin bonding agents on dentin permeability. *American Journal of Dentistry* 2000; 13(1):21-7.
 8. Camps J. Efficiency and cytotoxicity of resin-based desensitizing agents. *American Journal of Dentistry* 2002; 15(5):300-4.