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Research Article

Treating the Twinge – BIOMIN

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Abstract

Introduction: Dentinal hypersensitivity is the pain due to irritating stimuli. It can be treated at home or by a dental surgeon, but most of than not, the patient does not get complete relief from the pain. Hence, this study was undertaken to evaluate clinical efficacy of a new desensitizing agent fluoro calcium phospho silicate (BIOMIN) in providing complete relief from dentinal hypersensitivity.

Aim: To compare the clinical efficacy of a new desensitizing agent fluoro calcium phospho silicate (BIOMIN) to two other dentifrices already available in the market in the management of dentinal hypersensitivity.

Materials and Methods: Ninety patients clinically diagnosed with dentinal hypersensitivity (DH) were included in the study and randomly allocated in three groups. The participants were randomly divided into three groups. Group A- toothpaste containing fluoro calcium phosphosilicate (BIOMIN). Group B- toothpaste containing Proarginine; Group C- toothpaste containing Potassium Nitrate. Dentinal hypersensitivity scores for tactile, air blast and cold-water spray were noted on a visual analogue scale at baseline and 15th day.

Result: Symptoms of dentinal hypersensitivity were reduced in all three groups. Group A showed a better result.

Conclusion: The dentifrice containing fluoro calcium phosphor silicate is more efficacious in managing dentinal hypersensitivity.

Keywords: Dentinal Hypersensitivity; fluoro Calcium Phosphosilicate; Proarginine; Potassium Nitrate

Introduction

Dentinal hypersensitivity (DH) is a short sharp pain arising from exposed dentin in response to various stimuli like thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other form of dental defect or pathology [1].

Various treatment modalities like decreasing nerve fibre excitability or occluding open dentinal tubules have been tried to reduce dentinal hypersensitivity [2]. Inspite of this, still none of the method/agent is considered as gold standard.

Hence, we undertook this study to evaluate efficacy of fluoro calcium phosphor silicate (BIOMIN) as an anti-hypersensitivity agent as compared to other agents already available in market.

Materials and Methods

The study was conducted in a reputed dental school. Ethical approval for this study (TDC-IRB-EC/165/2017) was provided by the Institutional Review Board Ethics Committee of Terna Dental College and Hospital, Navi Mumbai on 22 november 2017.

Inclusion criteria

1. Individuals with hypersensitivity to hot, cold or sour-stimuli
2. Good periodontal health
3. Age between 20-60 years
4. Patients who readily gave informed consent.

Exclusion criteria

1. Subjects having active periodontal disease
2. Restored teeth, fractured teeth, teeth with attrition, pulpitis, non-vital teeth and carious teeth
3. Subjects undergoing orthodontic treatment
4. Pregnant and lactating women
5. Subjects taking analgesics
6. Subjects using desensitizing toothpaste in last 3 months.

Study design

A total of 90 patients were included. Patients were divided into 3 groups. Each patient was advised to brush their teeth twice daily using the Bass technique.

1. Group A -Tooth paste containing fluoro calcium phosphor silicate (BIOMIN)
2. Group B - Tooth paste containing Proarginine
3. Group C - Tooth paste containing Potassium Nitrate.

VAS scores were recorded at baseline based on the following parameters

a. Tactile sensation
b. Cold water spray
c. Airblast (30 psi).

Follow up on 15th day and all the three parameters were recorded again.

During the study period, the use of other oral hygiene products as well as any other dental treatment for hypersensitive teeth was not permitted. Drugs that may alter the perception of pain were not permitted within 24 hours of the assessment.

Result

There were no drop outs in the study and no adverse effects were reported in any of the groups. Visual Analoge Scale score was recorded for all the patients at baseline and 15 days for all the 3 parameters.i.e. airblast, cold water spray and tactile sensation.

Intragroup comparison showed a statistically significant improvement from baseline to 15 days in all the three groups. The results are shown in table 1-3.

Parameter	Mean Diff	SD	t	Df	P
Airblast	2.70000	1.26355	11.704	29	0.00*
Cold water spray	4.00000	1.43839	15.232	29	
Tactile sensation	2.33333	1.53877	8.305	29	

Table 1: Intragroup comparision of sensitivity in group A using Paired t test.

*Statistically significant at P<0.05. SD – Standard deviation. df-degree of freedom

Parameter	Mean Diff	SD	t	Df	P
Air blast	1.66667	.66089	13.813	29	0.00*
Cold Water Spray	1.96667	.71840	14.994	29	
Tactile Sensation	.86667	.73030	6.500	29	

Table 2: Intragroup comparision of sensitivity in group B using Paired t test.

*Statistically significant at P<0.05. SD – Standard deviation.df-degree of freedom.

Parameter	Mean Diff	SD	t	Df	P
Air blast	1.06667	.25371	23.028	29	0.00*
Cold water spray	1.13333	.34575	17.954	29	
Tactile sensation	.73333	.63968	6.279	29	

Table 3: Intragroup comparision of sensitivity ingroup c using Paired t test.

*Statistically significant at P<0.05. SD – Standard deviation.df-degree of freedom.

Intergroup comparison revealed that patients in Group 1 showed statistically significant results in all-time intervals as compared to the other two groups for air blast and cold water. Tactile sensation did not show any significant improvement in either of 3 groups, results of which are depicted in table 4-6.

Group	Mean	SD	ANOVA (F)	P
A	4.2333	1.90613	.743	.478*
B	4.3000	1.20773		
C	3.8667	1.22428		

a) AT BASELINE.

*Statistically significant at P<0.05. SD – Standard deviation.

Group	Mean	SD	ANOVA (F)	P
A	1.5333	1.10589	12.715	.000*
B	2.6333	.96431		
C	2.8000	1.09545		

b) AT 15 DAYS

*Statistically significant at P<0.05. SD – Standard deviation

Table 4: Intergroup comparison of sensitivity between 3 groups using Anova test forairblast score at baseline and 15 days.

Group	Mean	SD	ANOVA(F)	P
A	5.2667	1.91065	2.763	.069*
B	4.2667	1.70057		
C	4.6000	1.37966		

a) AT baseline

*Statistically significant at P<0.05. SD – Standard deviation

Group	Mean	SD	ANOVA(F)	P
A	1.2667	1.01483	24.392	.000*
B	2.3000	1.36836		
C	3.4667	1.25212		

b) AT 15 days

*Statistically significant at P<0.05. SD – Standard deviation

Table 5: Intergroup comparison of sensitivity between 3 groups using Anova test forcold water spary score at baseline and 15 days.

Discussion

Dentinal hypersensitivity is usually seen in patients between 20 to 50 years of age [3]. Canines and premolars are usually affected [4]. Dentin is naturally sensitive because of extensions of odontoblasts in dentinal tubules and formation of dentine–pulp complex [5]. Various theories have been proposed regarding the mechanism of action of dentinal hypersensitivity.

Group	Mean	SD	ANOVA(F)	P
A	3.4667	2.71310	14.660	.000*
B	1.4667	1.13664		
C	1.2333	.77385		

a) At baseline

*Statistically significant at P < 0.05. SD – Standard deviation

Group	Mean	SD	ANOVA(F)	P
A	1.1333	1.38298	3.213	.045*
B	.6000	1.00344		
C	.5000	.57235		

b) At 15 days

*Statistically significant at P < 0.05. SD – Standard deviation

Table 6: Intergroup comparison of sensitivity between 3 groups using Anova test fortactile sensation score at baseline and 15 days.

There are three different theories of dentin hypersensitivity

- **Direct innervation theory:** According to this theory dentin is penetrated by nerve endings which extend to the dentino-enamel junction [6]. Direct mechanical stimulation of these nerves will initiate an action potential and patient experiences pain.
- **Odontoblast receptor:** This theory states that odontoblasts acts as receptors by themselves and relay the signal to a nerve terminal [7].
- **Hydrodynamic theory:** Brannstrom (1964) has proposed that dentinal pain is due to hydrodynamic mechanism, i.e., fluid force [8]. Out of the three theories the most widely accepted theory is the hydrodynamic theory. It is observed that the wider tubules increase the fluid movement and thus the pain response [9].

It has been stated in the literature that dentinal hypersensitivity develops in two phases: lesion localization and lesion initiation [10]. Causes of dentinal hypersensitivity range from loss of enamel via attrition, abrasion, erosion or abfraction. It can also be attributed to gingival recession due to abrasion caused by tooth brush, flap surgery, preparation of tooth for crown [11].

The patent dentinal tubules are naturally occluded by saliva by transporting calcium and phosphate ions into them to induce tubule plugging and thus forming a surface protective layer of a salivary glycoprotein [12]. However, this process of natural tubule

occlusion is very slow, and the tubule plugging may be easily removed by both dietary acid and physical insult (e.g., tooth brushing). Hence, saliva does not provide long lasting relief. Various treatment options have been proposed for treatment of dentinal hypersensitivity [13].

Due to their low cost and ease of application desensitizing pastes have been used widely in the past for treating dentine hypersensitivity. So far, there has not been any desensitising paste which can be considered as gold standard and the quest for an ideal desensitising agent is always on. It has been observed that an exposure of dentinal tubules to acid and saliva could reverse the reduction in permeability caused by the desensitizing agents, hence, an ideal dentifrice needs to not only reduce the dentine permeability, but also maintain the occlusion effects for long time inspite of acid challenges [14].

Hence in this study, we compared the clinical efficacy of a new desensitizing agent fluoro calcium phospho silicate (BIOMIN) to two other dentifrices already available in the market.

Findings from the present study suggest that all the three groups were effective in treating dentinal hypersensitivity, but the group of patients treated with fluoro calcium phospho silicate (BIOMIN) showed greater reduction in sensitivity as compared to the other two group of patients treated with pro arginine and potassium nitrate.

The mechanism of action of toothpaste in group A (BIOMIN) which offered long lasting relief and protection from dentinal hypersensitivity is described in following four steps [15].

- **Step 1:** Chemical Bonding: its particles chemically bind to the tooth surface
- **Step 2:** Release of minerals: components slowly dissolve to release calcium, phosphate and fluoride ions into saliva.
- **Step 3:** Rapid Apatite Formation: ions precipitate and crystallize to form fluorohydroxyapatite over dentin surface and within dentinal tubules. These highly acid resistant crystals provide deep occlusion within dentinal tubules
- **Step 4:** Enamel Remineralization: sustained release of fluoride ions rebuilds and strengthens enamel.

Results of the study showed a statistically significant reduction in dentinal hypersensitivity in patients treated with fluoro calcium phosphor silicate (BIOMIN) after 15 days follow-up period when compared to pro arginine and potassium nitrate. These results match the findings from the study done by Gautam V and Halwai H in 2017 on comparison of clinical efficacy of four dentifrices in the management of dentinal hypersensitivity and concluded that the dentifrice containing fluoro calcium phosphosilicate is more efficacious in managing dentinal hypersensitivity [15]. It has been observed that the % tubular occlusion (OCT) with (BioMin) containing dentifrice was significantly higher than other dentifrice like (NovaMin) and a fluoride containing dentifrice [16].

Limitations of The Study

1. Study duration was limited
2. Small sample size.

Conclusion

With dentin hypersensitivity presenting with such a high frequency, a fast acting, durable, effective treatment modality is needed to alleviate the episodes of pain. Toothpaste containing fluoro calcium phospho silicate (BIOMIN) has shown better results in reducing dentinal hypersensitivity in comparison to other two commercially available toothpastes i.e toothpaste containing proarginie and potassium nitrate. Hence it can be used as a potent desensitizing agent.

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Nil.

Conflict of Interest

Nil.

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