

Comparative Evaluation of NOVAMIN Based Paste versus BIOMIN Based Paste in Dental Hypersensitivity

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Abstract: The objective of this study was to estimate and compare the dentin hypersensitivity reduction after Novamin based paste (SHY NM) paste and Biomin based paste (Elsenz) in an adult population. The study population included 100 subjects, who visited the out-patient department of periodontics, Govt Dental College and Hospital Srinagar in need of hypersensitivity problem. After conducting routine examinations, Tactile, VAS and thermal tests were used to assess the sensitivity. The measurement of sensitivity was carried out by using a 10 cm visual analog scale before and after desensitizing paste. The results were analyzed statistically using the Mann-Whitney U test. The results showed that patients who were prescribed Biomin based pastes (Elsenz) had more favourable results than Novamin based pastes (Shy NM). The results of the present study demonstrated that Patients with Biomin based paste reported more dentin hypersensitivity reduction than patients with Novamin based paste evaluated with thermal, tactile, VAS scale

Keywords: Elsenz (Biomin Based paste), Shy NM (Novamin based paste), Dental hypersensitivity, Tactile Stimuli, Thermal Stimuli, VAS.

INTRODUCTION

Dentin hypersensitivity following is frequently encountered oral health problem. Dentin hypersensitivity is a “short, sharp pain arising from exposed dentin in response to stimuli typically thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other form of dental defect or pathology [1]. The first part of the definition provides a clinical description of dentin hypersensitivity, whereas the second part aids in its differential diagnosis.

Dentin hypersensitivity typically afflicts individuals in the age range of 20-49 years, especially 30-39 years [2,3]. Numerous studies, which have included clinical evaluations by trained examiners through patient-based surveys, have reported prevalence figures in the range of 15-20% [4, 5]. However, higher levels, of up to 57% for individuals in general dental practice settings, and up to 98% in patients following periodontal therapy, have been reported [1,2,6,7]. Women are more frequently affected, and at younger mean age [8]. Dentin hypersensitivity is most commonly observed in the buccal-cervical regions of the canine and pre-molar teeth, sites, which are also most susceptible to gingival recession.

The hydrodynamic theory suggests that dentin hypersensitivity occurs when an external stimulus, such

as cold air, induces a change in fluid flow within the dentin tubules. This, in turn, results in a pressure change across the dentin, which activates the nerve response, causing a painful sensation. For the hydrodynamic mechanism to induce pain, the dentin tubules must become exposed, be open at the exposed surface, and patent at the pulp. *Ex vivo* studies have shown that sensitivity is strongly correlated with the number and diameter of exposed and open dentin tubules [11].

The recent additions to the plethora of active ingredients in dentifrices for the treatment of dentine hypersensitivity include a bioactive glass formulation (NovaMin, Dr Reddy's pharmaceuticals) [9]. NovaMin, is a bioactive glass which when exposed to an aqueous media provides calcium and phosphate ions forming a hydroxy-carbonate apatite like layer that is

chemically similar to that present in enamel and dentine. More recently patented bioactive glass toothpaste (BioMin) which is also marketed in India (Elsenz, Group Pharmaceuticals Ltd., India) containing fluoride with high phosphate content and small particle size has been developed.

Although saliva plays a pivotal role in naturally reducing dentine hypersensitivity by transporting and plugging calcium and phosphate into the dentinal tubules, this natural process may be insufficient to induce rapid occlusion and reduce dentine hypersensitivity in most individuals. Although it has been extensively demonstrated that some dentifrices are able to reduce dentine permeability *in vitro* there is little information regarding their effects under a simulated oral environment, subsequent to an acid challenge and artificial saliva immersion. There are limited published data on comparing the effectiveness of these two Bioglass products or on their ability to withstand an acid challenge which could in turn reverse the tubular ability of the Bioglass particles as well any reduction in permeability (e.g. fluid flow within the dentinal tubules). As exposure to acid and saliva could reverse the reduction in permeability caused by the desensitizers and dentine bonding agents, an ideal dentifrice needs not only to reduce the dentine permeability, but also maintain the occlusion effects in the face of an acid challenges and artificial saliva immersion [10].

MATERIALS & METHODS

Subjects

Study population consisted of 100 subjects, who visited the outpatient department of periodontics, Government dental college and Hospital srinagar for hypersensitivity. The informed consent of all the subjects who participated in this clinical investigation was obtained.

Clinical assessments

All subjects were given an oral examination to ensure good general health except for the symptoms of

dentin hypersensitivity. Detailed clinical and radiographic investigations were performed on all subjects to exclude conditions of teeth, which might have caused pain similar to dentin hypersensitivity. VAS, Tactile stimulus and thermal stimulus (water jet at room temperature, 15°C and 45°C) were used to assess hypersensitivity. Sensitive teeth were identified with an explorer passed cervically over the abutment tooth. Ten minutes following tactile stimulation, dentin hypersensitivity was elicited using a jet of water to approximately the same anatomical feature of the tooth as had received the tactile stimulus.

Assessment of sensitivity

Immediately following stimulation, the subjects were asked to grade their overall sensitivity using a 10 cm visual analog scale (VAS)[4,5]. Labeled at the extremes with “no pain,” at the 0 cm end of the scale, and “severe pain,” at the 10 cm end of the scale. The VAS is considered reliable because the amount of pain in one patient can be measured multiple times (at least twice) and results of each test for that individual compare favorably. Measurements from the scale were made in millimeters giving a scoring range of 0-10. After the VAS was recorded, 50 subjects were placed on Elsenz paste and 50 were placed on SHY NM paste. The subjects were assessed after 4weeks of paste prescription. The VAS, Thermal and tactile scores showed less values in Elsenz prescribed patients than Shy NM prescribed after one month of use. The data were compiled and subjected to statistical analysis.

Statistical analysis Data were analyzed on an intention-to-treat basis with the subject and teeth as the unit of statistical analysis. In our study, we expressed the descriptive statistics as mean ± standard deviation, based on the 10-cm VAS. We used the Mann-Whitney U test to conduct pairwise comparisons. In addition, we used the Wilcoxon signed rank test to determine the differences between participant's responses to before and after paste application in response to tactile and thermal stimuli.

Table-1: Descriptive statistics of comparison of dentin hypersensitivity between Novamin based paste and Biomin based paste , based on the VAS scale

Name of Paste	Statistics	At Baseline	After 1 month
Novamin	Mean	3.70	0.50
	N	50	50
	SD	1.650	1.632
Biomin	Mean	3.80	0.25
	N	50	50
	SD	1.640	1.502

Table-2: Wilcoxon signed ranks test–determination of participants’ responses at baseline and one month after prescription in response to tactile and thermal stimuli

Name of Paste	Statistics	1 month-baseline
Novamin	Z	-0.232
	SIGNIFICANCE	0.82
Biomin	Z	-3.324

DISCUSSION

The aim of the present study was to compare the desensitizing effects of Biomin and Novamin containing dentifrices, following a citric acid challenge as there currently does not appear to be any published studies comparing these two desensitizing dentifrices. This present *in vitro* study demonstrated that the Biomin and Novamin containing dentifrices provide considerable tubular occlusion of the patent dentinal tubules after two minutes of application. Upon comparison, the Biomin containing dentifrice, showed better values in VAS, tactile, thermal parameters as compared to a Novamin containing dentifrice. Several *in vitro* and *in vivo* investigations have shown the efficacy of different toothpastes in occluding dentinal tubules [11-17]. The amorphous sodium calcium phospho-silicate present in the Novamin containing toothpaste showed a strong attraction for collagen [17]. Due to the high collagen content of dentine, Novamin binds to the exposed dentine surfaces and physically occlude the dentine tubules [10].

Burwell *et al.* [18] conducted a series of studies showing that a single application of NovaMin with a concentration of above 3%, either in a daily-use dentifrice or a professionally applied prophylaxis paste, was more effective in improving parameters in thermal, tactile, VAS after one months of paste application. Furthermore, these studies also demonstrated that a single application of NovaMin in these models resisted a repeated acid challenge. Biomin containing dentifrice showed a greater percentage of reduction in hypersensitivity as compared to the Novamin containing dentifrice which was statistically significant.

Saliva naturally occludes the patent dentinal tubules by transporting calcium and phosphate ions into the tubules to induce tubule plugging and by forming a surface protective layer of a salivary glycoprotein with calcium and phosphate. 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), thus rendering it neither effective nor reliable in providing lasting relief of dentine hypersensitivity. In the present *in vitro* study, there was a small increase in the percentage of dentinal tubule occlusion in all three dentifrice groups which were not statistically significant.

CONCLUSION

The results from the present study suggested that the percentage of dentinal tubule occlusion following an application of a Biomin containing dentifrice onto a dentine surface was statistical significant from the Novamin containing dentifrices. Biomin and Novamin containing dentifrices demonstrated resistance to a citric acid challenge, the BioMin containing dentifrice significantly showed

better resistant to a citric acid challenge compared to the NovaMin containing dentifrice.

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