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Original Research

Assessment of the efficacy of in-office calcium-phosphate-based desensitizer

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***ABSTRACT*:**
Background: Dental hypersensitivity (DH) is a common oral disease characterized by a short and sharp sensation of pain in response to thermal, tactile, osmotic, evaporative or chemical stimuli. The present study was conducted to assess the efficacy of in-office calcium-phosphate-based desensitizer. **Materials & Methods:** The present study was conducted on 45 patients with complaint of dental hypersensitivity since 2 months. They were divided into 3 groups ie TMD vs TMDSS, TMD vs NaFV and TMDSS vs NaFV. The selected product was applied with a brush for 30 seconds. The first outcome taken into consideration was the residual DH, respectively, at 15 days, then 3 months, and then 6 months after treatment. **Results:** The VAS scale estimated marginal means; there was a significant pain reduction at t1, t2 and t3 vs t 0 in the TMD group ($p<0.05$). Similarly in the TMDSS group and NaFV treatment, there was a significant reduction at t1, t2 and t3 ($p<0.05$). **Conclusion:** Authors found that with the progression of time, dental hypersensitivity decreases. All materials found to be equally effective.
Key words: Dental hypersensitivity, Pain, Tactile.

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INTRODUCTION

Dental hypersensitivity (DH) is a common oral disease characterized by a short and sharp sensation of pain in response to thermal, tactile, osmotic, evaporative or chemical stimuli. It has a wide prevalence rate in 3%-98% of the adult population. The most common age group is 20–50 years.[1] The range includes 67% of patients suffering from transient sensitivity during bleaching treatments, whose pain negatively impacts their quality of life and leads them to stop the treatment.[2] It has been found that the pain arising from the exposed dentinal tubules can compromise daily activities such as social interaction, eating and drinking. The pain occurs due to the exposure of the cervical dentine surface following the loss of enamel or the recession of the marginal gingiva in association with the loss of cementum.[3]

It is assumed that increased fluid flowing in the open dentin tubules due to osmotic, tactile, chemical, or thermal stimuli causes changes in pressure, resulting in stimulation of pulp nerve endings. The hydrodynamic theory suggests that two factors might be responsible for DH onset: exposed dentin and open dentinal tubules.[4]

The treatment options for DH are based on the use of both agents capable of occluding the dentinal tubules thanks to their chemical, physical, or photobiomodulative properties and agents capable of inhibiting the nerve activity.[5] Agents used to obtain physical occlusion of dentinal tubules are pumice paste, sodium bicarbonate, hydroxyapatites, bioglasses, glass ionomers, dentin bonding agents, and resins; treatments aimed at obtaining chemical occlusion include fluorides, oxalates, glutaraldehyde-based agents, and calcium compounds; a photobiomodulating effect is obtained with laser therapy; and, finally, potassium nitrates and guanethidine are used to induce nerve desensitization. All these treatments options seem to lead to better outcomes if compared with placebos, but a comparison between treatment groups did not revealed significant differences.[6] The present study was conducted to assess the efficacy of in-office calcium-phosphate-based desensitizer.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It consisted of 45 patients with complaint of dental hypersensitivity since 2 months. Ethical clearance was obtained from institutional ethical committee. All patients were informed regarding the study and written consent was obtained.

Patient information such as name, age, gender etc. was recorded. They were divided into 3 groups ie TMD vs TMDSS, TMD vs NaFV and TMDSS vs NaFV. For each patient, the two selected teeth were then randomly assigned to their specific treatment. In all, hypersensitivity was subjectively and objectively assessed. The first evaluation was based on the VAS scale, which ranges from 0 (no pain) to 10 (maximum bearable pain). The objective evaluation was based on the Schiff scale: 0 indicates that patients do not respond to air stimulus; 1 indicates that patients respond but do not request stimulus discontinuation; 2 indicates that patients request stimulus discontinuation or, alternatively, move away from the stimulus; 3 indicates that patients consider stimulus to be painful and request discontinuation. The selected product was applied with a brush for 30 seconds. The first outcome taken into consideration was the residual DH, respectively, at 15 days, then 3 months, and then 6 months after treatment. The adverse events reported at each follow-up point and possibly due to the desensitizing treatment were also recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant (P< 0.05).

RESULTS

Table I Distribution of patients

Groups	Group I	Group II	Group III
Agent used	TMD	TMDSS	NAFV
Number	15	15	15

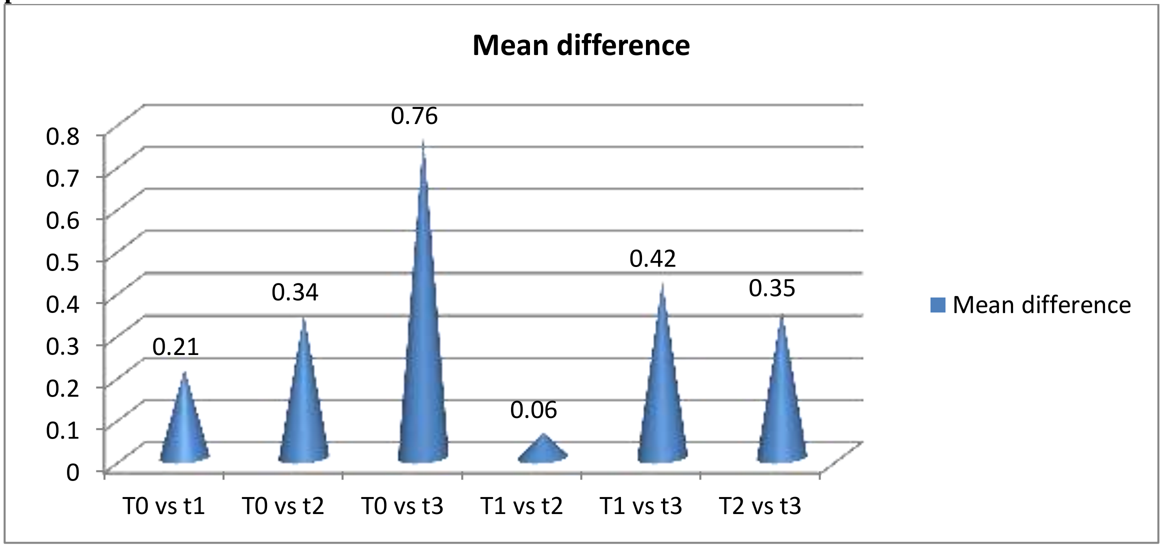
Table I shows that group I used TMD, group II TMDSS and group III NAFV. Each group had 15 patients.

Table II Comparison of time factor in VAS scale

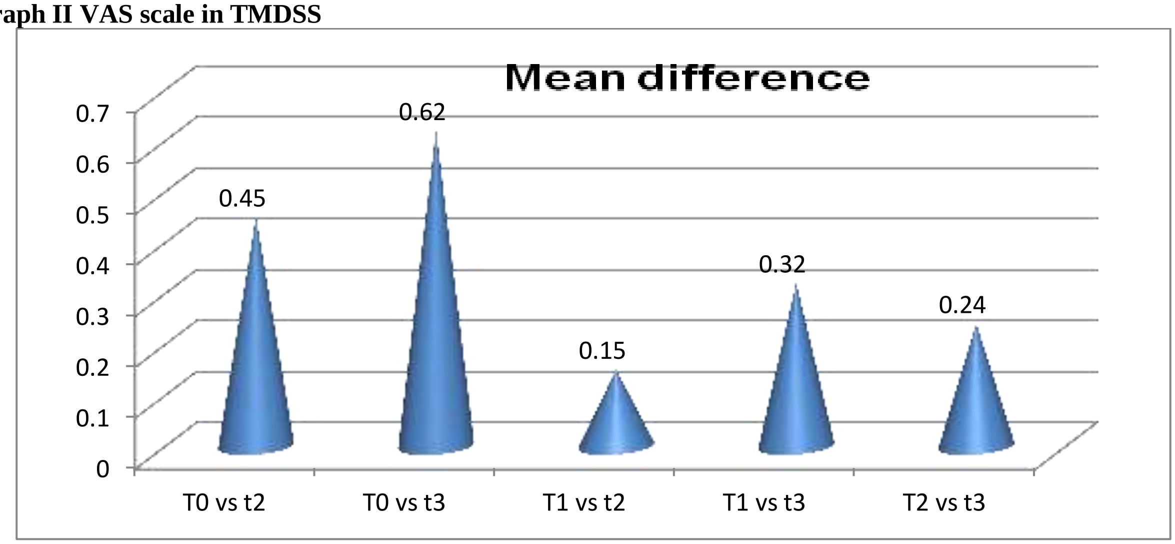
Treatment	Time point comparison	Mean difference	P value
TMD	T0 vs t1	0.21	<0.05
	T0 vs t2	0.34	<0.05
	T0 vs t3	0.76	<0.05
	T1 vs t2	0.06	>0.05
	T1 vs t3	0.42	<0.05
	T2 vs t3	0.35	<0.05
TMDSS	T0 vs t1	0.23	<0.05
	T0 vs t2	0.45	<0.05
	T0 vs t3	0.62	<0.05
	T1 vs t2	0.15	>0.05
	T1 vs t3	0.32	<0.05
	T2 vs t3	0.24	>0.05
NAFV	T0 vs t1	0.35	<0.05
	T0 vs t2	0.42	<0.05
	T0 vs t3	0.63	<0.05
	T1 vs t2	0.12	>0.05
	T1 vs t3	0.35	<0.05
	T2 vs t3	0.12	>0.05

Table II, graph I, II, III shows that VAS scale estimated marginal means; there was a significant pain reduction at t1, t2 and t3 vs t 0 in the TMD group (p<0.05). Similarly in the TMDSS group and NaFV treatment, there was a significant reduction at t1, t2 and and t3 (p<0.05).

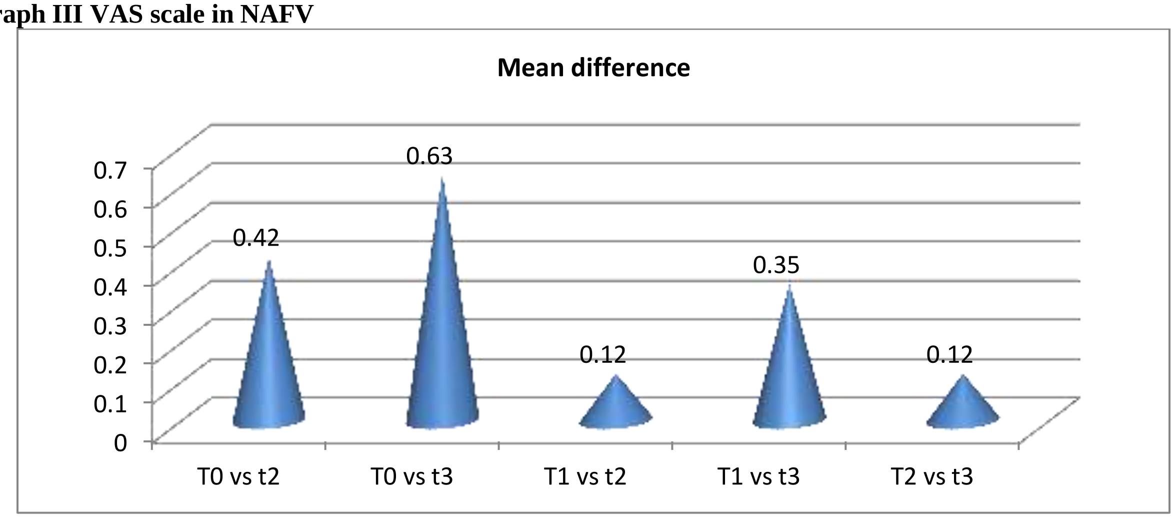
Graph I VAS scale in TMD



Graph II VAS scale in TMDSS



Graph III VAS scale in NAFV



DISCUSSION

The most widely accepted physio-pathologic mechanism of DH is Brannström's "hydrodynamic theory".[7] According to this theory, the pain is due to fluid shifts in the oral exposed tubules as external stimuli induce an outward and/or inward flow of dentinal fluid, which indirectly stimulate the pulp nerves.[8] Consequently, any therapy for DH has to interact with the hydrodynamic chain acting at the surface of the patient's dentinal tubules or at the neural transmission pathway.[9] During the last 50 years, a large number of both self-applied and professionally administered agents have been advocated in the market for the relief of DH. These materials contain a wide range of active ingredients, such as fluoride, oxalates, potassium nitrate and calcium phosphates. Calcium phosphate compounds forming biomimetic hydroxyapatite have gained considerable interest.[10] They have high biocompatibility and remineralisation capacity. The present study was conducted to assess the efficacy of in-office calcium-phosphate-based desensitizer.

In present study, group I used TMD, group II TMDSS and group III NAFV. Each group had 15 patients. We found that in VAS scale estimated marginal means; there was a significant pain reduction at t1, t2 and t3 vs t 0 in the TMD group ($p<0.05$). Similarly in the TMDSS group and NaFV treatment, there was a significant reduction at t1, t2 and and t3 ($p<0.05$).

Uegi et al[11] in their study seventy-five patients suffering from dentin hypersensitivity (DH) were randomly allocated to a treatment with one of three desensitizing agents: tetracalcium phosphate and dicalcium phosphate anhydrous powder mixed with the liquid solution provided by the manufacturer, or the same powder mixed with saline solution, or 5% fluoride varnish. Airblast hypersensitivity was assessed after 15, 90, and 180 days, using both Schiff and Visual Analogue (VAS) scales at baseline. Twenty-five teeth from 5 subjects with exposed dentin were previously planned and chelated with EDTA, then either treated with one of the investigated agents or not treated at all. After two weeks, the teeth were extracted and analysed via SEM. No significant differences due to treatment factors were found ($p = 0{,}535$), while a significant time-related effect ($p = 0{,}000$) was observed. All treatments could progressively reduce pain perception at each follow-up time point. SEM analysis has shown partial or total occlusion of the dentinal tubules in all treatments. No occlusion was seen in nontreated teeth.

Usai et al[12] compared the 24-week effectiveness of Teethmate Desensitizer (TD), a pure tetracalcium phosphate (TTCP) and dicalcium phosphate dihydrate (DCPD) powder/water, to that of Dentin Desensitizer (DD), and Bite & White ExSense (BWE), both of calcium phosphate crystallites. A total of 105 subjects were selected. A random table was utilized to form three groups of 35 subjects. DH was evaluated using the evaporative sensitivity, tactile sensitivity tests, and the visual analogue scale (VAS) of pain. Response was recorded before the application of the materials (Pre-1), immediately after (Post-0), at 1 week (Post-1), 4 weeks (Post-2), 12 weeks (Post-3) and 24 weeks (Post-4). All the materials decreased DH after 24 weeks in comparison to Pre-1. However, the TTCP/DCPD cement showed the greatest statistical efficiency. The significant decrease of VAS scores produced by TD in the long term suggested the material as the most reliable in the clinical relief of DH.

Reported DH prevalence varies considerably among published studies because different study designs are used to assess DH in different settings. For almost a century, calcium phosphate-based cements have been used as bone-graft substitutes, and about thirty years ago, they started to be put to the test as desensitizing agents.

CONCLUSION

Authors found that with the progression of time, dental hypersensitivity decreases. All materials found to be equally effective.

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