

Comparative evaluation of ultrasonic scaling using two different magnification loupes and dentifrices in patients with dentinal hypersensitivity

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Citation of this Article: Dr. Anilkumar R, Dr. Rekha Rani Koduganti, Dr. Haripriya Rajaram, Dr. P. Veerendranath Reddy, Dr. J.S. Prasanna, Dr. Himabindu Gireddy, Dr. Manasa Ambati, Dr. Bharathchandra G, “Comparative evaluation of ultrasonic scaling using two different magnification loupes and dentifrices in patients with dentinal hypersensitivity”, IJDSIR- February - 2022, Vol. – 5, Issue - 1, P. No. 55 – 63.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: Dentinal hypersensitivity is a problem encountered by many patients visiting the dental hospital for scaling.

Desensitizing dentifrices applied before scaling could reduce the sensitivity and therefore make the patient feel more comfortable during the procedure. The main aim of

the study was to compare scaling procedure using two different magnification loupes, and desensitizing tooth pastes when used as adjuncts in patients with dentinal hypersensitivity.

Methodology: Fifty-two samples equally divided into two groups, were treated with 2.5x loupes and 3.5x loupes using two desensitizing tooth pastes. Pocket depth (PD), Plaque index (PI), gingival index scores (GI) were evaluated at baseline and 1 month postoperatively. Using tactile stimulus and air stimulus, the sensitivity scores were recorded using Visual Analog Scale (VAS) at baseline, immediately after desensitising paste application, and 1 week, and 1 month after scaling and root planing.

Results: All of the patients completed the study protocol. It was observed that patients in Group II (3.5^x loupes) showed better improvement in clinical parameters and VAS scores when compared to Group I (2.5^xloupes), though the values were not statistically significant. Whereas regarding the dentifrices, the calcium sodium phosphosilicate tooth paste, showed lower VAS scores than Herbal tooth paste but the results were not significant statistically.

Conclusion: Both the groups performed well with not much difference observed related to the outcomes. More randomised controlled trials with larger samples are mandatory to validate the usefulness of magnification loupes and desensitising pastes in nonsurgical periodontal therapy.

Keywords: Chronic periodontitis, Dentinal Hypersensitivity, Magnification loupes, desensitising dentifrices, Ultrasonic scaling and root planing.

Introduction

Periodontitis is an inflammatory condition of the teeth's supporting tissues caused by one or more microorganisms, resulting in progressive deterioration of

the periodontal ligament and alveolar bone, as well as increased pocket formation, gingival recession, or both.^[1]

The key etiologic cause for the progression of the disease is biofilm and calculus existing on the tooth surface.^[2]

Mechanical debridement by ultrasonic scaling is more efficient in plaque and calculus removal, it cleanses the bacterial endotoxins from the radicular surface preserving the cementum, The use of ultrasonic instruments allows for continuous water flow during the treatment, which provides for better visualisation and patient acceptance.^[3] Magnification devices were used in dental clinical practice to increase treatment precision, and thus decrease the pain perception. Surgical microscope, endoscope and magnification loupes are the most frequently used devices in dentistry.^[4] Dentine hypersensitivity (DH) is defined as a quick, sharp pain that arises from exposed dentine in reaction to stimuli that are often thermal, evaporative, tactile, osmotic, or chemical, and that cannot be attributed to any other type of dental defect or pathology.^[5] The most typically affected teeth are the canine and premolars, mainly the cervical areas of the buccal side, with frequency ranging from 4% to 74 percent in 20-50 year olds, with predilection in females.^[6] Caries, stress to enamel and dentine, erosion, abrasion, attrition, and gingival recession are all etiological causes for dentinal hypersensitivity.^[7] The severity of pain can be measured using a categorical scale (i.e., mild, moderate, or severe pain) or the Visual Analog Scale. Three mechanisms for dentinal hypersensitivity have been proposed in the literature: neural theory, odontoblastic theory, and hydrodynamic theory. The hydrodynamic theory proposed by Branstrom is the most widely accepted.^[8] DH treatment options include dentifrices with potassium and sodium salts that block the tubules (reduce nerve

transmission), laser therapy, and iontophoresis.^[9] Many studies have asserted the supremacy of calcium sodium phosphosilicate over potassium nitrate. The ingredients in Vantej® (Dr Reddys's Labs, Hyderabad, India) desensitising tooth paste is Calcium sodium phosphosilicate, a bioactive glass that forms hydroxyapatite-like crystals on the dentinal surface when it combines with saliva. The composition of this freshly produced mineralized layer dentin is identical to that of bone, enamel, and dentin. It also functions as a barrier against oral fluids, preventing DH.^[10] People are of late showing keen interest in herbs as they have minimal side effects. Orazink oral gel (Virgoune Medsol Private Limited, Hyderabad, Telangana, India) is a newly developed herbal oral gel that claims to provide enough pain relief for DH patients. It contains a combination of zinc oxide, amla, Tulsi, and curcumin extract. Zinc compounds like zinc chloride and zinc citrate have been demonstrated to provide many health benefits. Zinc has anti-calculus, antibacterial, and antiplaque properties and due to its astringent qualities, zinc compounds could impact organic components of dentine, and also the demineralization and remineralization of that tissue.^[11] The present study was planned to compare the effects of two desensitising dental pastes when used as adjuncts in individuals with DH as well as to compare scaling procedures using two different magnification loupes.

Materials and methods

A parallel arm interventional trial included 52 patients aged between 18-50yrs who came to the Outpatient ward of a tertiary referral care centre in Hyderabad. The Institutional Ethics Committee provided ethical approval for this study. (IEC/PERIO/PR/385-20). The study comprised of 52 patients split into two groups. Group I included 26 patients with moderate periodontitis who underwent scaling using 2.5x magnification loupes. This

group was subdivided into 1A wherein 13 patients received Herbal tooth paste, and 1B wherein 13 patients received Calcium sodium phosphosilicate tooth paste immediately after SRP and were instructed to continue using the dentifrices for one month. A similar protocol like Group I was followed in Group II (26 patients) with 3.5x magnification loupes. Patients who had mild periodontitis, and had not undergone periodontal therapy in the previous year, a caries free oral cavity, with a minimum of two teeth with DH and >4mm probing depth, gingival recession or cervical abrasion were included and patients with systemic disorders, those taking antibiotics or anti-inflammatory medicines, smokers, and pregnant or lactating women were excluded from the study. The clinical parameters Probing Depth (PD), Plaque Index (PI), Gingival Index (GI) were assessed at baseline and one month after SRP using UNC-15 probe. The tactile sensitivity was assessed with a blunt probe applied on the affected tooth with light manual pressure in the mesiodistal direction.^[12] Air blast sensitivity assessment was performed with the air component of an air-water syringe. A 1-2 seconds blast of air perpendicular to the exposed dentin was directed onto the buccal portion of the affected tooth maintaining a distance of 1 cm. Two fingers, were positioned on adjacent proximal teeth to block from air blast. The VAS was used to track hypersensitivity; scores were recorded on a 10-cm scale, with values ranging from 0 to 1 for no pain, 2-3 for minor discomfort, 4-6 for moderate pain, and 7-10 for severe pain.^[13] After scaling, a pea-sized amount of toothpaste on a disposable applicator tip was applied to affected tooth for 5 seconds, followed by 1 minute of polishing with a rotary polishing cup. The sensitivity was assessed preop, immediately after scaling, 1 week and 1 month later. The significance and necessity of the study was

conveyed to the selected samples, and their informed consent was obtained.

Results

Intragroup Comparison of clinical parameters: In Group IA (Herbal tooth paste) the PD at baseline and 1 month postop was 4.110 and 2.466, the PI at baseline and 1 month postop was 2.356 and 0.499, and the GI at baseline and 1 month postop was 2.218 and 0.316. The total time taken for scaling was 26.15 minutes. The clinical variables in Group IA have shown improvement from baseline to 1 month after scaling. In Group IB (Calcium sodium phosphosilicate tooth paste) the PD at baseline and 1 month postop was 4.136 and 2.343, the PI at baseline and 1 month postop was 2.320 and 0.344, and the GI at baseline and 1 month postop was 2.210 and 0.384. The total time taken for scaling was 26 minutes. The clinical variables in Group IB have shown improvement from baseline to 1 month after scaling, However, comparison within the group did not show any statistically significant results. (Table I)

In Group IIA (Herbal tooth paste) the PD at baseline and 1 month postop was 4.102 and 2.388, the PI at baseline and 1 month postop was 2.182 and 0.376, and the GI at baseline and 1 month postop was 2.216 and 0.315. The total time taken for scaling was 21.923 minutes. The clinical variables in Group IIA have shown improvement from baseline to 1 month after scaling. In Group IIB (Calcium sodium phosphosilicate tooth paste) the PD at baseline and 1 month postop was 4.138 and 2.353, the PI at baseline and 1 month postop was 2.292 and 0.402, and the GI at baseline and 1 month postop was 2.211 and 0.383. The total time taken for scaling was 21.769 minutes. The clinical variables in Group IIB have shown improvement from baseline to 1 month after scaling, However, comparison within the group did not show any statistically significant results. (Table II)

Intergroup comparison of clinical parameters: In the herbal tooth paste group, the PD at baseline was 4.11 and 4.10 in Group IA and Group IIA which improved to 2.466(IA) and 2.388(IIA) one month after SRP. The PI at baseline was 2.356 and 2.182 in Group IA and Group IIA which improved 0.499 (IA) and 0.376 (IIA) one month after SRP. The GI at baseline was 2.218 and 2.216 in Group IA and Group IIA which improved 0.316 (IA) and 0.315 (IIA) one month after SRP. An intergroup comparison using herbal tooth paste did not show any statistically significant results pertaining to the clinical parameters. However, related to the operator duration Group IIA (21.923) showed lesser time taken for intervention than Group IA (26.153) which was highly significant ($p=0.000$). (Table III)

In the calcium sodium phosphosilicate tooth paste group, the PD at baseline was 4.136 and 4.138 in Group IB and Group IIB which improved to 2.388(IIA) and 2.353(IIB) one month after SRP. The PI at baseline was 2.182 and 2.292 in Group IB and Group II B, which improved to 0.376 (IB) and 0.402 (IIB) one month after SRP. The GI at baseline was 2.216 and 2.211 in Group IB and Group IIB which improved to 0.315 (IB) and 0.383 (IIB) one month after SRP. An intergroup comparison using Calcium sodium phosphosilicate tooth paste did not show any statistically significant results pertaining to the clinical parameters. However, related to the operator duration Group IIB (21.769) showed lesser time taken for intervention than Group IB (26.000) which was highly significant ($p<0.001$). (Table IV)

TSA & ABSA Scores: The mean TSA score in IA, IB, IIA, and IIB gradually decreased from baseline to after dentifrice application and scaling, immediately, after 1 week and after 1 month. Groups IIA and IIB showed significant improvement after 1 month with IIB performing the best. (Fig I)

The mean ABSA score in IA, IB, IIA, and IIB gradually decreased from baseline to after dentifrice application and scaling, immediately, after 1 week and after 1 month. Groups IIA and IIB showed significant improvement after 1 month with IIB performing the best. (Fig II)

Discussion

Periodontitis is an inflammatory condition aggravated by local factors such as plaque and calculus, which is inhabited by colonies of microorganisms that produce endotoxins contributing to the disease progression. The cornerstone of periodontal therapy is complete mechanical debridement via SRP. Use of magnification loupes during SRP is beneficial as it improves the clinician's visual acuity thus aiding in the complete removal of the calculus remnants resulting in a smooth planed tooth surface. A study was done by Mohammed Fahad et al wherein 10 patients were split equally into two groups, 5 patients underwent conventional SRP and 5 other patients underwent SRP with magnification loupes (microsurgical) used as adjunctive tools. Though the clinical parameters did not yield significant difference between the groups, pertaining to the magnitude of pain perceived by the patients the microsurgical group fared better.^[14] In this study a comparison between 2.5x (Group I) and 3.5x loupes (Group II) was made while doing ultrasonic scaling and it was observed that the patients enrolled in Group II showed a better improvement in clinical parameters after 1 month, however an intergroup comparison yielded insignificant results. Because DH pain is mostly a subjective symptom, effective pain management necessitates rigorous assessment and regular revision of the patient's dental pain experience. Nonirritant medications, fast acting, and consistent are all requirements for DH treatment. The use of desensitizing

dentifrices by the patients has been made popular because of economic feasibility and ease of application.^[15] The tactile (TSA) and evaporative (ABSA) stimuli were assessed in this study as different stimuli might elicit diverse pain sensations of varying intensities.^[16] The Calcium sodium phosphosilicate tooth paste used by patients in Group II showed the least and therefore better TSA and ABSA scores 1 month after SRP when compared to the same dentifrice used in Group I, as well as the Herbal tooth paste used in both the groups. However, the scores were not of statistical significance. The same findings were observed in a study done by another researcher wherein 20 subjects having DH were randomly divided into test (Calcium sodium phosphosilicate) and positive control (Potassium nitrate) groups. The VAS to air evaporative stimulus was assessed at 2 weeks, 4 weeks and 8 weeks. Though the test group (Calcium sodium phosphosilicate) showed earlier improvement at 2 weeks in VAS scores, at later time points the difference was not statistically significant.^[17] A systematic review done by another clinician based on randomized controlled clinical trials, supported the use of calcium sodium phosphosilicate toothpaste formulations in providing relief of pain from dentin hypersensitivity.^[18] Laser therapy and iontophoresis are two more DH treatments that are used. They do, however, have a few drawbacks, including being more expensive, and having doubtful long-term usefulness.^[19] Visualisation of fine details is enhanced by increasing the object size. This can be achieved by getting closer to the objects or by magnification. Magnification reduces eye strain therefore permitting the ocular muscles to remain more relaxed, moreover the clinician's posture is also not compromised, thus averting musculoskeletal disturbances.^[20] Magnification loupes provide better surgical access due to improved

visibility. The overall body posture also is not compromised, with forward flexion of the head, and shoulder bending being minimal while using loupes. Also, the researchers have observed that several adjustments have to be made by the clinician using magnification loupes and that they should be trained to use them correctly.^[21] The limitation of this study is the small sample size. Hence in future many studies with a larger number of samples have to be conducted to further support the promising role of magnification loupes in nonsurgical periodontal therapy.

Conclusion

From this present study it can be concluded that magnification increases the efficacy of the operator during SRP. 3.5x loupes showed lesser working time during scaling, than 2.5x magnification loupes. As for the dentifrices, calcium sodium phosphosilicate paste showed better reduction in VAS scores compared to the herbal tooth paste. The results obtained from this study however could be substantiated only by conducting more randomized controlled trials with a larger sample size.

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Legend Tables and Figures

Table 1: Intragroup Comparison in Group I (2.5X Loupes IA: Herbal tooth paste, IB: Calcium sodium phosphosilicate tooth paste).

Variables	Group	N	Mean	Std. Deviation	P value
PD baseline	IA	13	4.1108	.25244	0.81
	IB	13	4.1362	.28342	
PD 1 month	IA	13	2.4669	.27879	0.22
	IB	13	2.3431	.22801	
PI baseline	IA	13	2.3562	.37170	0.80
	IB	13	2.3200	.34574	
PI 1 month	IA	13	0.4991	.22564	0.07
	IB	13	0.3448	.19812	
GI baseline	IA	13	2.2185	.24772	0.94
	IB	13	2.2100	.32088	
GI 1 month	IA	13	0.3160	.13924	0.37
	IB	13	0.3841	.15426	
Operator duration In minutes	IA	13	26.1538	2.99572	0.90
	IB	13	26.0000	3.48807	

Statistical test applied: Independent samples t test

PD- Probing depth, PI-Plaque Index, GI- Gingival Index, P Value- Probability Value

Table 2: Intragroup comparison in Group II (3.5X Loupes - IA: Herbal tooth paste,1B: Calcium sodium phosphosilicate tooth paste).

Variables	Group	N	Mean	Std. Deviation	P value
PD baseline	IIA	13	4.1023	.16290	0.65
	IIB	13	4.1385	.23993	
PD 1 month	IIA	13	2.3885	.20428	0.65
	IIB	13	2.3538	.18081	
PI baseline	IIA	13	2.1823	.27791	0.30
	IIB	13	2.2923	.25318	
PI 1 month	IIA	13	0.3762	.14992	0.75
	IIB	13	0.4023	.25450	
GI baseline	IIA	13	2.2169	.24475	0.30
	IIB	13	2.2115	.31031	
GI 1 month	IIA	13	0.3154	.13955	0.36
	IIB	13	0.3831	.15842	
Operator duration In minutes	IIA	13	21.9231	1.93484	0.85
	IIB	13	21.7692	2.31495	

Statistical test applied: Independent samples t test

PD- Probing depth, PI-Plaque Index, GI- Gingival Index, P Value- Probability Value

Table 3: Intergroup Comparison between Group I and Group II using Herbal tooth paste

Variables	Group	N	Mean	Std. Deviation	P value
PD baseline	IA	13	4.1108	.25244	0.92
	IIA	13	4.1023	.16290	
PD 1 month	IA	13	2.4669	.27879	0.42
	IIA	13	2.3885	.20428	
PI baseline	IA	13	2.3562	.37170	0.18
	IIA	13	2.1823	.27791	
PI 1 month	IA	13	0.4991	.22564	0.11
	IIA	13	0.3762	.14992	
GI baseline	IA	13	2.2185	.24772	0.51
	IIA	13	2.2169	.24475	
GI 1 month	IA	13	0.3160	.13924	0.36
	IIA	13	0.3154	.13955	
Operator duration In minutes	IA	13	26.1538	2.99572	0.000 HS
	IIA	13	21.9231	1.93484	

Statistical test applied: Independent t test; HS – Highly significant at $p < 0.01$

PD- Probing depth, PI-Plaque Index, GI- Gingival Index, P Value- Probability Value

Table 4: Intergroup comparison between Group I and Group II using calcium sodium phosphosilicate tooth paste

Variables	Group	N	Mean	Std. Deviation	P value
PD baseline	IB	13	4.1362	.28342	0.98
	IIB	13	4.1385	.23993	
PD 1 month	IB	13	2.3431	.22801	0.89
	IIB	13	2.3538	.18081	
PI baseline	IB	13	2.3200	.34574	0.81
	IIB	13	2.2923	.25318	
PI 1 month	IB	13	.3448	.19812	0.52
	IIB	13	.4023	.25450	
GI baseline	IB	13	2.2100	.32088	0.36
	IIB	13	2.2115	.31031	
GI 1 month	IB	13	.3841	.15426	0.26
	IIB	13	.3831	.15842	
Operator duration in minutes	IB	13	26.0000	3.48807	0.001 HS
	IIB	13	21.7692	2.31495	

Statistical test applied: Independent samples t test; HS – Highly significant at $p < 0.01$

PD- Probing depth, PI-Plaque Index, GI- Gingival Index, P Value- Probability Value.

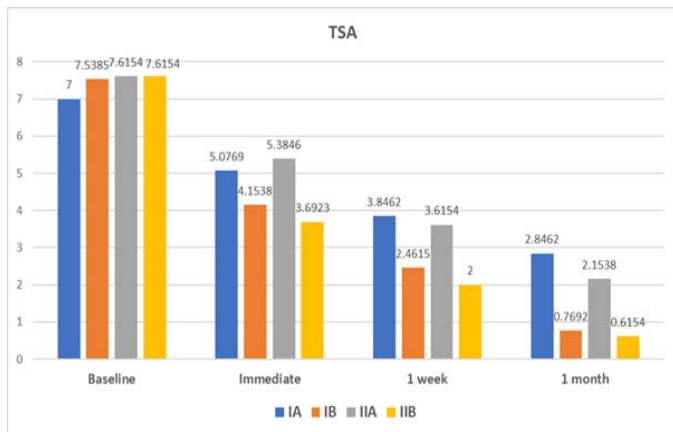


Fig 1: Intergroup comparison of TSA between the groups.

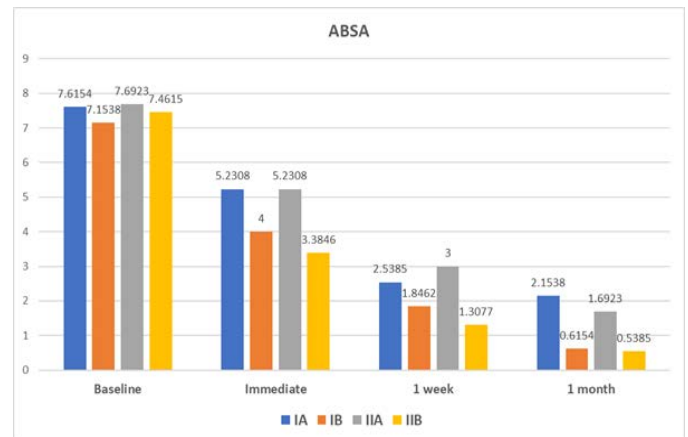


Fig 2: Intergroup comparison of ABSA between the groups.