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Comparative evaluation of a low-level laser and topical desensitizing agent for treating dentinal hypersensitivity: A randomized controlled trial

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Abstract
Aim: To compare the effect of potassium nitrate topical desensitizing agent with low level laser therapy for dentinal hypersensitivity.
Materials and Method: 60 patients were recruited for the study. Patients were divided into three groups.
Group 1: Low level laser irradiation for dentinal hypersensitivity.
Group 2: 5% potassium nitrate toothpaste topically. Group 3: low level laser irradiation plus 5% potassium nitrate
Results: Pain was significantly reduced post operatively in all three groups. Best pain reduction was for the laser plus potassium nitrate group. No significant difference was observed with combination of low power laser and potassium nitrate combination.
Conclusion: potassium nitrate and low level laser irradiation proved equally effective for reducing dentinal hypersensitivity in patients. No significant advantage was observed with laser and potassium nitrate combination.

Keywords: Potassium nitrate, low level laser, dentin hypersensitivity

Introduction
Dentinal hypersensitivity is described as "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." Its prevalence ranges from 2.8% to 74%. [1, 3]. When there is loss of protective enamel/cementum, the dentinal tubules get exposed to external stimuli that results in hypersensitivity. Various theories were proposed regarding the mechanism of dentin hypersensitivity, among them Brannstroms hydrodynamic theory is the most widely accepted theory that states that external stimuli cause fluid movement inside the dentinal tubules either in the inward or outward direction and promote mechanical deformation of nerve endings at the pulp/dentin. It will be transmitted as a painful sensation [4]. Based on this theory, two major methods of treating dentin hypersensitivity devised are tubular occlusion and blockage of nerve activity [5]. These modalities involve the application of various chemicals (desensitizing agents) such as potassium or ferric oxalates, potassium nitrate, stannous fluoride, sodium fluoride, sodium monofluorophosphate (MFP), strontium chloride, copal varnishes, calcium hydroxide, fluoride treatments, dentin bonding agents, or iontophoresis. The desensitizing agents are applied either by the dentist (in office treatment) or used by the patient as home application. Potassium nitrate was introduced as a desensitizing agent by Hodosh [6]. It has been one of the widely prescribed desensitizing agents. It has been used in concentrations of 1%, 2%, 5%, 10%, and 15% or as a saturated solution. 5% is said to be most effective and is also incorporated into dentifrices [7]. Potassium nitrate is supposed to reduce hypersensitivity by inducing a sustained depolarization of nerve membrane as put forward by Pashlay [8]. It has also been postulated that blockage of dentinal tubules by potassium nitrate reduces sensitivity [9]. The advent of dental lasers has given us an interesting treatment option for dentinal hypersensitivity and has become a research interest in the last decade. The middle output power lasers such as ND: YAG lasers and CO2 lasers have enjoyed significant success in treating this condition. However, they are very expensive and

bulky to lug around. Low‐ level lasers such as He‐ Ne lasers and GaAlAs lasers are relatively unexplored in dentistry [10]. Hence, the aim of this study is to compare the clinical Effectiveness of low‐ level laser and Potassium nitrate desensitizing agent on cervical dentin hypersensitivity with the help of visual analog scale (VAS).

Materials and Methods

Before the study, ethical clearance was obtained from the Institutional Review Board. In addition, written consent from the patients was also obtained. The present randomized controlled trial included patients in the age group of 20–60 years, visiting the Outpatient Department of Conservative Dentistry and Endodontics with cervical dentinal hypersensitivity. The following inclusion and exclusion criteria were followed

Inclusion criteria

- Dentinal hypersensitivity caused by gingival recession or cervical abrasion/erosion
- Preoperative VAS score of ≥2
- Systemic health of the patient is good

Exclusion criteria

- Teeth with caries, defective restorations, occlusal restorations, and chipped teeth
- Deep periodontal pockets (probing depth >6 mm), periodontal surgery within the previous 3 months, and
- Subjects with orthodontic appliances or bridge work
- Cervical defect >2 mm horizontally
- Use of desensitizing toothpaste in the last 3 months
- Patients allergic to ingredients used in the study
- Any gross oral pathology
- Systemic diseases such as eating disorders, chronic diseases, pregnancy and lactation, acute

Myocardial infarction within the past 6 months, use of pacemaker, uncontrolled metabolic disease, major psychiatric disorder, heavy smoking, or alcohol abuse. Diagnosis was made based on the patient's history, clinical examination, and pulp vitality tests. To assess tooth sensitivity, a controlled air stimulus (evaporative stimulus) and cold water (thermal stimulus) were used. Sensitivity was measured using a 10‐ cm VAS score, with a score of zero being a pain‐ free response and a score of 10 being excruciating pain or discomfort. Scoring of tooth sensitivity was done using controlled air pressure from a standard three‐ way dental syringe on a fixed dental chair at 40–65 psi at ambient temperature, directed perpendicularly and at a distance of 1–3 mm from the exposed dentin surface, while adjacent teeth were protected with cotton rolls to prevent false‐ positive results. This was followed by scoring of tooth sensitivity using 10 ml of ice‐ cold water applied to the exposed dentin surface, while neighboring teeth were isolated during testing using the operator's fingers and cotton rolls. A period of at least 5 min was allowed between the two stimuli on each tooth. Patient were asked to record their pain scores immediately after stimulus. Patients were randomly divided into three groups. Group 1:Low‐ level laser irradiation, the cervical area was irradiated with a low‐ level (Miltadent, Russia) the cone tip (beam converging) was used as close as possible with the tooth surface without contact, resulting in a spot size of 0.8 cm2. Laser beam was directed perpendicular to tooth surface. Group 2: 5% Potassium nitrate topical desensitizing agent toothpaste was applied to the exposed dentin for 10 min. Group 3.low level laser irradiation plus 5% potassium nitrate. After recording sensitivity scores at baseline, patients were advised to use the toothpaste with soft bristle tooth brushing twice a day. Patients were directed to refrain from any other dentifrice or mouth rinse during the trial but were allowed to continue their normal oral hygiene practice. The sensitivity scores were recorded, immediately and 1 week and 3 months after the therapy.

Statistical considerations

Normality of the data distribution was checked using Shapiro–Wilk test. Since no normal distribution was attained, nonparametric tests were used. For the comparison between two groups at any given time interval, Mann–Whitney U‐ test was used. For within‐ group comparison, Friedman's test was used.

Results

60 patients were recruited for the study based on the inclusion and exclusion criteria. The pain scores for both groups were recorded, and both intra‐ .and inter‐ group comparisons were done. Table 1 shows the mean VAS scores for various Groups at baseline, immediate postoperatively, 1‐ week postoperatively, and 3‐ month postoperatively, respectively. There was a significant reduction in pain in both the groups over the evaluation period of 3 months (P = 0.001) inter group comparison showed no significant difference in pain scores among various groups at various time intervals. Group 3 showed the best pain reduction at 3 months. [Table 2].

Table 1: Mean pain scores among various groups

Groups	No of Patients	Time	Mean Pain Score	X2	P
Group 1	20	Preoperative	5.8	4.5	.001*
		Postoperative	2.6		
		1 Week	2.2		
		3 Months	1.5		
Group 2	20	Preoperative	5.8	3.2	.001*
		Postoperative	3.2		
		1 Week	2.9		
		3 Months	2.2		
Group 3	20	Preoperative	5.7	3.0	.001*
		Postoperative	2.3		
		1 Week	2.1		
		3 Months	1.3		

Table 2: Inter group comparison of pain scores

Time	No of patients	Mean vas score			*Z*	*P*
		Group 1	Group 2	Group 3		
Preoperative	20	5.8	5.8	5.7	.011	.91
Postoperative						
1 Week		2.6	3.2	2.3	.154	.12
3 Months		2.2	2.6	2.1	.190	.089
		1.5	2.2	1.3	.190	.089

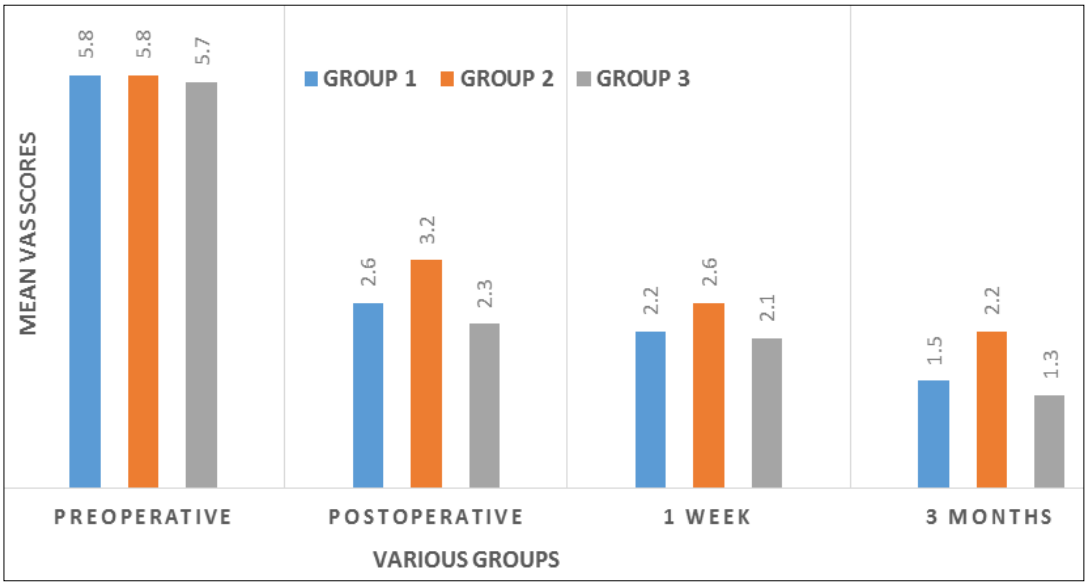

Fig 1: Mean pain scores among groups

Discussion

The traditional method for treating dentin hypersensitivity is based on the application of topical desensitizing agents. However, it has some disadvantages such as repeated application, longer treatment time, and patient compliance. Use of newer treatment modalities for hypersensitivity such as LASERs has increased rapidly in the Last two decades [4, 5]. In the present study potassium nitrate showed significant pain reduction after pplication.it was not better than laser application as Potassium nitrate acts by reducing the excitability of the interdental nerves in the pulp by depolarizing them [11, 12]. Potassium ions have to traverse the length of the dentinal tubule in sufficient quantity to cause depolarization. The results show that at the end of 10 minutes after treatment, the concentration of potassium ions in the dentinal tubules was not sufficient to make the nerves in excitable and it takes longer time for the potassium ions to reach the nerves. The effect of desensitization achieved by K ions decreased with time and this could be attributed to a decrease in concentration of the ions in dentinal tubules

Although low‐ level lasers and potassium nitrate topical desensitizing agents present distinct modes of action in the present study, both treatments provided a significant overall relief in dentin hypersensitivity. Most experimental and clinical studies regarding the effectiveness of low‐ level laser therapy on dentin hypersensitivity were performed using semiconductor diode lasers with wavelengths in the range of 635–830 nm and dosages in the range of 2–10 J/cm. None of these laser outputs have shown to cause any physical changes or damage to dentin. However, a small fraction of the laser energy at 830 nm wavelength is transmitted through dental hard tissues to reach the pulp. Similarly, the 904 nm wavelength used in this study showed no clinical changes in dentin and reduced the dentinal hypersensitivity immediately, 1 week after and 3 months after the first application. Low‐ power laser therapy generally promotes bio modulatory effects, minimizes pain, and reduces inflammatory processes. However, their ability to block depolarization of nerve fibers and depress neural transmission seems to play a major role in reducing dentin hypersensitivity. When applied with a sufficient level of intensity, it causes an inhibition of action potentials by forming reversible varicosities (bending of axons) where there is an approximately 30% neural blockade within 10– 20 min of application [13]. Although precise mechanism of action is unknown. Besides its immediate analgesic effect, if laser is used within the correct parameters, it will stimulate the normal physiological cellular functions. Therefore, at subsequent appointments, the pulpal tissue would be less injured and inflamed and the laser would stimulate the production of sclerotic dentin, thus promoting the internal obliteration of dentinal tubules. This could explain the extended reduction in pain scores at 1 week and 3 months after the first dose. In this study, the reduction in immediate postoperative pain was almost similar for all the groups (P = 0.12), which could suggest that combining low level laser with potassium nitrate did not play an influential role. For more effective treatment, further investigation is required to increase the understanding of the mechanisms and etiology of dentinal pain.

Conclusion

Within the limitations of the present study it can be concluded that both potassium nitrate and low level laser irradiation are an effective method of relieving pain from dentinal hypersensitivity. Combining the two does not give any significant advantage for pain reduction in dentinal hypersensitivity.

References

1. Taani SD, Awartani F. Clinical evaluation of cervical dentin sensitivity (CDS) in patients attending general dental clinics (GDC) and periodontal specialty clinics (PSC). J Clin Periodontol. 2002; 29:118-22.
2. Rees JS, Addy M. A cross-sectional study of buccal cervical sensitivity in UK general dental practice and a summary review of prevalence studies. Int J Dent Hyg. 2004; 2:64-9.
3. Liu HC, Lan WH, Hsieh CC. Prevalence and distribution of cervical dentin hypersensitivity in a population in Taipei, Taiwan. J Endod 1998; 24:45-7.
4. Yilmaz HG, Kurtulmus-Yilmaz S, Cengiz E, Bayindir H, Aykac Y. Clinical evaluation of Er, Cr: YSGG and GaAlAs laser therapy for treating dentine hypersensitivity: A randomized controlled clinical trial. J Dent. 2011; 39:249-54.
5. Trushkowsky RD, Oquendo A. Treatment of dentin hypersensitivity. Dent Clin North Am. 2011; 55:59-608,
6. Hodosh M. A superior desensitizer‐ po**t**assium nitrate. J Am Dent Assoc. 1974; 88:831-2.
7. Kanapka JA. Over the counter denitrifies in the treatment of tooth hypersensitivity. Review of clinical studies. Dent Clin North Amm. 1990; 34:545-59.
8. Pashley DH. Dentin permeability, dentin sensitivity and treatment through tubule occlusion. J Endod. 1986; 12:465-74.
9. Kim S. Thermal stimuli in dentin hypersensitivity. Endod Dent Traumatol. 1986; 2:138-40.
10. Corona SA, Nascimento TN, Catirse AB, Lizarelli RF, Dinelli W, Palma-Dibb RG, *et al.* Clinical evaluation of low‐ level laser therapy and fluoride varnish for treating cervical dentinal hypersensitivity. J Oral Rehabil 2003; 30:1183-9.
11. Markowitz K, Bilotto G, Kim S. Decreasing intra dental nerve activity in the cat with potassium and divalent cations. Arch Oral Biol. 1991; 36:1-7.
12. Peacock JM, Orchardson R. Effects of potassium ions on action potential conduction in A‐ and C‐ fibers of rat spinal nerves. J Dent Res. 1995; 74:634-41.
13. Cotler HB, Chow RT, Hamblin MR, Carroll J. The use of low level laser therapy (LLLT) for musculoskeletal pain. MOJ Orthop Rheumatol, 2015, 2. pii: 00068.