



Comparison of Cyanoacrylate Glue and Fluoride Iontophoresis in The Treatment of Dentine Hypersensitivity

**MAYA SANJEEV
INDURKAR**

PROFESSOR H.O.D. & P.G. GUIDE, DEPARTMENT OF PERIODONTOLOGY, GOVERNMENT DENTAL COLLEGE AND HOSPITAL, AURANGABAD, MAHARASHTRA -431001.

**PALLAVI S.
BHAILUME**

POST GRADUATE STUDENT, DEPARTMENT OF PERIODONTOLOGY, GOVERNMENT DENTAL COLLEGE AND HOSPITAL, AURANGABAD, MAHARASHTRA 431001

ABSTRACT

Aim: To evaluate and compare the efficacy of two treatment modalities Cyanoacrylate agent and Iontophoresis with acidulated phosphate gel (APF) application for dentinal hypersensitivity.

Materials and Methods:

The subjects recruited in this randomized clinical study gave a history of tooth hypersensitivity and verified by light strokes with dental explorer. The patients were subjected to a tactile test, air blast and cold water stimuli and their responses were recorded on a verbal discomfort scale. A total of 40 sites were divided into Group A— Cyanoacrylate agent; and Group B—1.23% APF gel iontophoresis. The teeth were evaluated immediately after the treatment and at the end of 1 week.

Results: The differences in the reduction in dentinal hypersensitivity in both the groups at 15 mins after the desensitization procedure and 1 week follow up were statistically non-significant suggesting that both the treatment modalities are equally effective for dentinal hypersensitivity.

Conclusion: Both the treatment modalities were equally effective and can be effectively used for the treatment of dentinal hypersensitivity.

KEYWORDS

DENTIN HYPERSENSITIVITY; FLUORIDE; IONTOPHORESIS; CYANOACRYLATE GLUE; APF GEL

INTRODUCTION

Dentin hypersensitivity (DH) is characterized by short, sharp pain arising from exposed dentin in response to stimuli, typically thermal, evaporative, tactile, osmotic or chemical, which cannot be ascribed to any other form of dental defect or pathology¹, and ceases after removal of the stimuli.² The hydrodynamic theory proposed by Brännström Aström in 1964 is the most acceptable theory in explaining the pain of dentin hypersensitivity³. For the DH to occur, dentin must be exposed to the oral environment, which occurs as a result of removal of the enamel layer and/or cementum by attrition, abrasion, erosion, or gingival recession. Moreover in 10% of individuals, as a result of a developmental anomaly, the enamel and the cementum do not meet, leaving an area of exposed dentin⁴⁻⁶.

Various modes of treatment at home or in dental office have been tried with varied success. The home measures include the use of desensitizing dentifrices or mouthwashes with active compounds such as sodium fluoride (NaF), potassium nitrate, strontium chloride, stannous fluoride, etc⁷⁻¹⁰. The office measures include the use of cavity varnishes, anti-inflammatory agents, fluoride compounds, calcium compounds, restorative resins, etc¹¹⁻¹⁵. These different modalities have shown varied results over time.

The method of iontophoresis was described by Pivati in 1747. Iontophoresis was first used in the early 1960s to treat dentin hypersensitivity. APF gel contain fluoride ions which causes formation of calcium – phosphorous precipitates as well as calcium fluoride (CaF₂) and fluorapatite (Fap) that block the dentinal tubules and decrease the permeability and sensitivity¹⁶.

Cyanoacrylate has an immediate desensitizing effect on hypersensitive dentin, it is biocompatible, and may be used to treat hypersensitive teeth. It blocks the dentinal tubules, pre-

vents displacement of fluids within the tubules, and results in little or no response to stimuli¹⁷. A commercial presentation of cyanoacrylate in the form of glue has proven to be biocompatible¹⁸. It has the advantages of being a low-cost product, readily available, easily applicable, effective and safe¹⁹. Although some authors have reported the use of cyanoacrylate in DH treatment,^{17,20} to the best of our knowledge, there are no reports in the literature on comparison of cyanoacrylate glue with fluoride iontophoresis in treatment of DH²¹.

Thus the main aim of this clinical study was to compare the efficacy of cyanoacrylate glue and iontophoresis using acidulated phosphate gel (APF) gel in providing relief from hypersensitivity.

MATERIALS AND METHODS

This randomized, split mouth design clinical trial compared two treatment modalities, namely, cyanoacrylate glue and iontophoresis using APF gel. This study is conducted in the Department of Periodontology, Govt. Dental College and Hospital, Aurangabad, India.

Forty sites were randomly divided into two treatment groups. Subjects fulfilling the inclusion and exclusion criteria were enrolled in the study.

Inclusion criteria were: History of tooth hypersensitivity to any stimuli; Good physical health; Willingness to participate in the study.

Exclusion criteria were: defective restorations, cracked tooth syndrome, fractured cusps, chipped teeth, deep periodontal pockets, or a tender tooth in the same quadrant as the hypersensitive teeth; orthodontic appliances, dentures, or bridge-work that would interfere with the evaluation of hypersensitivity; taking antibiotics and/or anti-inflammatory drugs; already undergoing treatment for tooth hypersensitivity; deep dental

caries or large restorations showing pulpal response; pregnant or lactating females; periodontal surgery within the previous 6 months; chronic systemic disease; or an unshielded pacemaker.

STUDY DESIGN AND TREATMENT:

The patients who qualified for study were evaluated using the three stimuli.

For all stimuli tests, patient response was recorded on the following scale:

- 0 = no significant discomfort, or awareness of stimulus;
- 1 = discomfort, but no severe pain;
- 2 = severe pain during application of stimulus; and
- 3 = severe pain during and after application of stimulus.22

Following stimuli tests were applied to evaluate the response of sites at baseline, after immediate treatment and after one week

Tactile test: Dental explorer was gently run across the affected surface of the tooth.

Air blast test: A blast of air from a 3-way dental syringe of dental equipment.

Cold water test: Ice cold water was slowly expelled onto the tooth surface with disposable syringe.

The teeth were isolated with rolls of cotton and the stimuli were applied.

A total of 40 teeth included in this study were randomly divided into two groups:

Group A :20 teeth treated with cyanoacrylate glue:

Group B: 20 teeth treated with 1.23% Acidulated Phosphate Fluoride gel applied using an iontophoresis delivery system (FI).

All patients underwent scaling and polishing before the study and were instructed not to use any other desensitizing agent during the study.

APPLICATION OF AGENTS:

Group A:

The selected teeth were isolated with cotton rolls, cleaned, and dried with cotton pledgets. The teeth assigned to the cyanoacrylate group were treated with single application of cyanoacrylate glue (RULISEAL®) using a micro-disposable applicator

Group B:

The selected tooth surface was dried and isolated, APF gel was applied. The iontophoresis circuit was completed and gradually increasing current was applied until the subject complained of pain or sensitivity. That value was marked as threshold level. APF gel was reapplied and iontophoresis was done at a lower ampere current for 60 seconds per tooth surface.

RESULTS:

There was decrease in dentinal hypersensitivity in both the groups 15 mins and 1 week after follow up compared to baseline. Table no 1 shows the average value of data obtained from the subjects to tactile test, air blast test and cold water test at baseline, just after 15mins of the desensitization procedure and after 1 week follow up

TABLE NO. 1: Average value of data obtained from the subjects to tactile test, air blast test and cold water test at baseline, just after 15mins of the desensitization procedure and after 1 week follows up

Group A: Cyanoacrylate					Group B: Iontophoresis			
	TOOTH NO.	AT BASELINE	IMMEDIATELY AFTER TREATMENT	AFTER ONE WEEK	TOOTH NO.	AT BASELINE	IMMEDIATELY AFTER TREATMENT	AFTER ONE WEEK
1	21	1.6	0	0	11	1	0	0
	23	1.6	0	0	12	1	0	0
	26	2.3	1	0.3	13	1	0.3	0
	31	1.6	0.6	0	41	2	0.6	0.3
	32	1.6	0	0	42	1	0	0
	33	1	0	0	43	1	0	0
	34	1	0	0				
	35	1	0	0				
	36	1.6	0	0				
	2	21	1.6	0	0	11	1	0.3
25		1.3	0	0	12	1	0	0
26		1.3	0	0	13	1	0	0
27		1.6	0	0	14	1	0	0
28		1	0	0.3	15	1	0	0
31		1.6	0.3	0.3	16	1.6	0.6	0.3
32		1.6	0	0	17	1	0	0
33		1	0	0	41	1	0	0
34		1	0	0	42	1.6	1	0
35		1	0	0	43	1	0	0
37		1.6	0	0	44	1	0	0
					45	1	0	0
					46	1	0	0
					47	1	0	0

The intergroup comparison was done by unpaired t test. The differences in the reduction in dentinal hypersensitivity in both the groups at 15 mins after the desensitization procedure and 1 week follow up were statistically nonsignificant. This suggests that both the treatment modalities are equally effective for dentinal hypersensitivity.

TABLE NO.2:
Inter – group Comparison between Group A and Group at baseline, after 15mins and after 1week follow up (Unpaired t test)

	P value	Significance
Baseline	0.007	Significant
After 15mins	0.601	Non-significant
After 1week follow up	0.642	Non-significant

Intra-group analysis was done using paired t test in both the groups. As shown in table no.3,

TABLE No. 3
Intra – group Comparison (Unpaired t test)

	GROUP A		GROUP B	
	P Value	Significance	P Value	Significance
Baseline to Immediately after 15 min	<0.0001	Extremely significant	<0.0001	Extremely significant
Baseline to 1 week	<0.0001	Extremely significant	<0.0001	Extremely significant
Immediately after 15 min to 1week follow up	0.314	Not significant	0.056	Not quite significant

In Group A i.e. cyanoacrylate glue group there was reduction in dentin hypersensitivity just 15mins after the procedure compared to baseline and the P value was < 0.0001 which suggested that the reduction was statistically significant.

There was also reduction in dentin hypersensitivity at 1 week follow up compared to baseline and the reduction was statistically significant. However when the result obtained immediately 15mins after the procedure was compared to 1week follow up, the differences were statistically non-significant.

In group B: Iontophoresis group there was reduction in sensitivity 15 mins after the procedure and at 1 week follow up compared to baseline and these reductions were statistically significant. But when reduction in sensitivity was compared from 15 mins to 1 week and it was statistically not significant

DISCUSSION:

Dentin hypersensitivity occurs due to exposure of terminal end of dentinal tubule to external stimuli. Therefore many treatment modalities aim to block these exposed terminal end. Iontophoresis is an electric device and produces electric current once the circuit is completed. By applying the appropriately charged electrical current, ionized drugs can be driven into tissue based on the principle that like charges repel and opposite charges attract. Various hypothesis have been proposed to explain the mechanism of action of iontophoresis. One is that electric current results in dead tract due to formation of reparative dentin. Second is that it alters the sensory mechanism and thus produces paresthesia. Third is that it may block the hydrodynamically mediated stimuli by microprecipitation of calcium fluoride²³. According to present study, iontophoresis can be effectively used for dentin hypersensitivity. The results obtained were in accordance with the previous studies done by – Modupeola et al 2002 where he compared 2% neutral solution of sodium fluoride using Desensitron II Iontophoresis device with current and the control teeth received the solution on the device without current. He observed

that fluoride desensitization with iontophoresis was more effective than topical fluoride application²⁴.

Indurkar and Sethi in 2015 compared APF gel iontophoresis with dentin bonding agent for desensitization and concluded that both the techniques are useful methods of treatment of DH25. Indurkar and Maurya in 2015 compared the efficacy of Diode laser and 1.23% APF gel iontophoresis for the treatment of dentinal hypersensitivity. And concluded that both the treatment modalities were equally effective and can be effectively used for the treatment of dentinal

Hypersensitivity26.

In the study by Javid et al²⁷, 33% sodium fluoride (NaF) paste was compared to cyanoacrylate in patients with DH. It was concluded that cyanoacrylate had an immediate desensitizing effect on hypersensitive dentin and was statistically more effective than NaF in reducing sensitivity to cold-air stimulation. The present study showed that cyanoacrylate glue and iontophoresis with APF gel were comparable in relieving pain after 15mins and 1week from baseline. This is justified by mode of action of cyanoacrylate as it obliterates the entry of dentinal tubules.

CONCLUSION:

This study is first of its kind to compare the Cyanoacrylate glue with 1.23% APF gel Iontophoresis for dentinal hypersensitivity. Both the treatment modalities showed comparable reduction in sensitivity immediately after procedure and at 1 week follow up compared to the baseline. Therefore, cyanoacrylate glue and 1.23% APF gel iontophoresis both can be effectively used for the treatment of dentinal hypersensitivity.

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