



**COMPARATIVE EVALUATION OF 2% LIGNOCAINE GEL AND 2%
AMITRIPTYLINE GEL IN REDUCING PAIN DURING ADMINISTRATION OF
LOCAL ANAESTHESIA INJECTION – A RANDOMIZED CONTROLLED TRIAL**

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ABSTRACT

Introduction – Topical anesthetic gel or cream is technique independent. Lignocaine is the most widely used topical anesthetic substance. Amitriptyline, has a variety of peripheral and central actions, including analgesia and pain relief. The current study's objective is to conduct a randomized control trial to compare the effectiveness of 2% lignocaine and 2% amitriptyline gel as topical anesthetic agents before applying local anesthesia.

Material & methods- A randomized, Triple Blind, Split mouth clinical study was performed on 58 patients aged between 18 to 60 years. Group 1 received 2% lignocaine and Group 2 received 2% amitriptyline. Blood pressure, pulse rate, and vitals were recorded and analyzed using SPSS version 20.0. The following statistical tests were done: ANOVA, Paired t-test, Wilcoxon test, and Friedman test. P-value ≤ 0.05 is considered statistically significant.

Results – Out of 58 study subjects, 39.65% were male and 60.35% were female. Statistically, a significant difference was observed in systolic BP & between Lignocaine and Amitriptyline gel group at the post-injection time period ($p \leq 0.05$). Statistically, a significant difference was observed in the taste of acceptance value, eye score, and motor score between the Lignocaine gel group and the Amitriptyline gel group ($p \leq 0.05$).

Conclusion – Amitriptyline has more efficiency as compared to Lignocaine when compared on different parameters.

Keywords- *amitriptyline, anxiety, anesthesia, lignocaine, topical gel*

Introduction

Anxiety is described as a condition of irritability accompanied by a fear of internal threats or a learnt response to one's own environment.¹ The most frequent problem encountered in the dental operatory is anxiety. It is a major source of difficulty since patients frequently refuse dental treatment. It is defined as a condition of worry that arises during the course of treatment and is connected to unfavorable future consequences, which are typically tied to a poor outlook on the family, a fear of pain and trauma, and perceptions of a failed earlier dental procedure.² In a randomised clinical experiment by Cho et al. with subjects who reported being extremely anxious, topical anaesthetics reduced the impact of anxiety on the discomfort of needle insertion.³ Injecting local anesthetic is a process that causes anxiety in and of itself.⁴ Furthermore, managing pain is dentistry's most crucial aspect. The dentist can lessen the pain of injections by adjusting the pH, temperature, and rate of injection of the local anaesthetic solution into the tissues.⁵ Another method is surface anesthesia, which comprises topical anesthetic, transcutaneous electronic nerve stimulation (TENS), and chilling to prepare the tissues before to injection.^{6,7}

Topical anesthetic gel or cream is widely accessible and technique independent. Topical anesthetic gel or ointment is the "holy grail" of painless local anesthesia in pediatric dentistry.

They are capable of penetrating the mucosal lining of the mouth and producing analgesia.^{8,9} They offer surface anaesthesia for a depth of 2-4 mm by stopping the sense nerves' terminal fibres from transmitting a signal. Modifying voltage-sensitive sodium channel

transmission that results from this change indirectly raises the action-potential threshold. Due to this property, topical anesthetic can effectively lessen the discomfort associated with needle insertion.

Topical anesthetics come in a variety of forms. The Gold standard topical anesthetic agent is lignocaine.¹⁰ However, side effects include allergic skin reactions, blisters, ulcers, and rarely methemoglobinemia. Amitriptyline, another type of LA, has analgesic property in neuropathic pain, possesses a wide range of peripheral & central activities including analgesia, relieves painful stimulus caused by needle penetration and is available in gel form and has higher depth of penetration & longer duration of action.¹¹

In this randomised control study, 2% lignocaine and 2% amitriptyline gel were tested for their efficacy as a topical anaesthetic agent before local anaesthesia was administered.

Material & methods

A randomized, Triple Blind, Split mouth clinical study was performed on 58 patients aged between 18 to 60 years who went to the Narsinhbhai Patel Dental College and Hospital in Visnagar, Gujrat at the Department of Conservative Dentistry & Endodontics. The plan was approved by institutional ethical committee of college. Group 1 received 2% lignocaine and group 2 received 2% amitriptyline.

Inclusion Criteria

- Patients who required bilateral Local Anaesthetic injection (infiltration or block) either in the upper or lower arch for any invasive procedure like restoration and endodontic procedure,
- Patients without prior exposure to Local Anaesthesia.
- Subjects that come under ASA I and ASA II

Exclusion criteria

- Patients who were under any medications, had a history of neurologic problems or systemic diseases, were allergic to Tri Cyclic Antidepressants (TCAs) or to local anesthetic, had neuropathy or were too young to understand instructions.
- Teeth with the Presence of sinus tract at the site of gel application.

Methodology

Prior to beginning the treatment, written informed consent was obtained from each patient. Each patient was considered as a pair case (Split mouth Technique).

Preparation of 2% Amitriptyline Gel:

As 2% Amitriptyline Gel was not available commercially, it was prepared at Nootan Pharmacy College, Visnagar, Gujarat. To Prepare 2% Amitriptyline Gel, 400mg of pure Amitriptyline drug (100% Powder form, Sunfarma PVT, Batch No-H13036) in powder form was dissolved in 20 ml of distilled water (Amanta Lifescience Pvt, Batch No- 15065) as the powder drug is highly soluble in water. Hydroxypropyl Methyl Cellulose (Oxford Laboratory Reagent Batch No- 40640007) was used to prepare gel form. 250 mg of HydroxyPropyle Methyl Cellulose (HPMC) was added to above-prepared solution and mixed well with the help of Remy Digital Stir to prepare gel. This was stored in airtight container.

The Patient, Operator, and Invigilator remained unaware of the gel used (i.e., Triple blinding). They were randomly asked to select a chit by using chit -pick method. Participant was instructed to report their pain experience using the Wong Backer Faces rating scale preoperatively. Preoperative Blood Pressure and Heart Rate were measured. Application site was first dried with the sterile cotton gauze, 0.5 ml of gel was taken in a mixing pad and then placed with the help of a cotton roll in the buccal vestibule at the site of treatment and gently rubbed for 3 minutes. The patient's acceptance of the taste was tested. After rubbing, injection of local anesthesia was given at the site of treatment. The Wong Backer Faces rating scale, vitals, sound, eye, and motor scale were measured. After Completion of the endodontic procedure, they were measured again. Repetition of the same procedure was done on another site.

Data were analyzed using SPSS version 20.0. The following statistical tests were done: ANOVA, Paired t-test, Wilcoxon test, and Friedman test. Statistical significance is defined as a P-value ≤ 0.05 .

Results -

The distribution of the subjects by gender is shown in Table 1. Out of 58 study participants, 39.55% of them were men and 60.35% were women.

Table 1: Gender-wise distribution of subjects

Gender	Number	Percentages
Male	23	39.65 %
Female	35	60.35 %
Total	58	100 %

Between the Lignocaine and Amitriptyline gel groups, there was statistically no discernible difference in systolic blood pressure at the baseline time point. Systolic blood pressure was lower in the amitriptyline group than in the lignocaine gel group (125.33 3.23 vs. 126.21 3.49). At the post-injection time period, a statistically significant difference in systolic blood pressure was seen between the Lignocaine and Amitriptyline gel groups. Systolic blood pressure was lower in the amitriptyline group (125.29 3.39 vs. 126.05 3.49) than in the lidocaine gel group. Between the Lignocaine and Amitriptyline gel groups, a statistically significant difference in systolic blood pressure was seen during the post-operative period. (Table 2)

Table 2: Systolic Blood Pressure-wise distribution between groups

Time period	Groups	Number	Systolic BP		P Value
			Mean	SD	
Baseline	Lignocaine gel	58	124.95	3.62	> 0.05 **
	Amitriptyline gel	58	124.74	3.35	
Post-injection	Lignocaine gel	58	126.21	3.49	≤ 0.05 *
	Amitriptyline gel	58	125.33	3.23	

Post-operative	Lignocaine gel	58	126.05	3.49	≤ 0.05 *
	Amitriptyline gel	58	125.29	3.39	

Level of Significance $P \leq 0.05$, * Significant, ** Non Significant

In terms of statistics, there was no discernible change in diastolic blood pressure between the groups receiving lignocaine and amitriptyline gel at the beginning of the study, following the injection, and after treatment. (Table 3)

Table 3: Diastolic Blood Pressure-wise distribution between groups

Time period	Groups	Number	Diastolic BP		P Value
			Mean	SD	
Baseline	Lignocaine gel	58	83.90	2.74	> 0.05 **
	Amitriptyline gel	58	84.43	2.57	
Post-injection	Lignocaine gel	58	85.24	3.28	> 0.05 **
	Amitriptyline gel	58	84.93	2.61	
Post-operative	Lignocaine gel	58	84.74	2.57	> 0.05 **
	Amitriptyline gel	58	85.09	2.97	

Level of Significance $P \leq 0.05$, * Significant, ** Non-Significant

At baseline, post-injection, and post-operative times, there was statistically no discernible difference in pulse rate between the Lignocaine and Amitriptyline gel groups. (Table 4)

Table 4: Pulse rate-wise distribution between groups

Time period	Groups	Number	Pulse rate		P Value
			Mean	SD	
Baseline	Lignocaine gel	58	83.52	3.32	> 0.05 **
	Amitriptyline gel	58	84.48	2.95	
Post-injection	Lignocaine gel	58	85.90	2.79	> 0.05 **
	Amitriptyline gel	58	86.02	2.59	
Post-operative	Lignocaine gel	58	85.78	2.84	> 0.05 **
	Amitriptyline gel	58	85.74	2.65	

Level of Significance $P \leq 0.05$, * Significant, ** Non-Significant

Between the Lignocaine gel group and the Amitriptyline gel group, there was statistically no discernible difference in WBFPRS values at the baseline time point. Values were less in Amitriptyline group (1.14 ± 1.05) than Lignocaine gel group (1.57 ± 1.17). Statistically, significant difference was observed in WBFPRS value between Lignocaine and Amitriptyline gel group at post-injection & postoperative time period. It was less in Amitriptyline gel group (0.55 ± 0.75) than Lignocaine gel group (0.78 ± 0.87) at post injection. (Table 5)

Table 5: WBFPRS-wise distribution between groups

Time period	Groups	Number	WBFPRS		P Value
			Mean	SD	
Baseline	Lignocaine gel	58	4.62	1.21	> 0.05 **
	Amitriptyline gel	58	4.53	1.09	
Post-injection	Lignocaine gel	58	1.57	1.17	≤ 0.05 *
	Amitriptyline gel	58	1.14	1.05	
Post-operative	Lignocaine gel	58	0.78	0.87	≤ 0.05 *
	Amitriptyline gel	58	0.55	0.75	

Level of Significance $P \leq 0.05$, * Significant, ** Non-Significant

Between the Lignocaine and Amitriptyline gel groups, a statistically significant difference was seen in the taste of acceptability value, eye score, and motor score. Amitriptyline gel group had a lower eye score (1.57 ± 0.53) than Lignocaine gel group (1.76 ± 0.65). In terms of statistics, there was no discernible change in the sound score between the Lignocaine gel group and the Amitriptyline gel group..(Table 6)

Table 6: Other parameters-wise distribution between groups

Parameters	Groups	Number	Parameters		P Value
			Mean	SD	
Taste of acceptance	Lignocaine gel	58	2.95	0.66	≤ 0.05 *
	Amitriptyline gel	58	3.26	0.76	
Sounds	Lignocaine gel	58	1.66	0.60	> 0.05 **
	Amitriptyline gel	58	1.55	0.50	

Eye	Lignocaine gel	58	1.76	0.65	≤ 0.05 *
	Amitriptyline gel	58	1.57	0.53	
Motor	Lignocaine gel	58	1.52	0.59	≤ 0.05 *
	Amitriptyline gel	58	1.34	0.47	

Level of Significance $P \leq 0.05$, * Significant, ** Non-Significant

Discussion

"Local anaesthesia" is a compound word made from the Greek words "an" (without) and "aesthesia" (sensation). Topical anaesthetic, infiltration anaesthesia, and conduction anaesthesia are the three types of local anaesthetic used in dentistry.¹² Topical anesthesia is the lack of sensation brought on by a direct application to the mucosal membrane.¹³

The most widely used local anaesthetic, lignocaine, also possesses antiarrhythmic properties. A person's capacity to metabolise it is compromised by liver disease because it is eliminated from the body through the liver. When applied topically, lignocaine suppresses ectopic discharges from afferent axons and does so by blocking sodium channels. Topical lignocaine's capacity to reduce both peripheral and cerebral nociceptor sensitivity and delay cerebral hyperexcitability.¹⁴

Topical anaesthetics work by momentarily obstructing nerve conduction close to the application site to inhibit the free nerve terminals that temporarily reduce feeling in the affected area. Nerve conduction is prevented because the cell membrane's permeability to sodium ions is reduced. As a result, the excitability threshold rises and the depolarization gradually lowers until the ability to initiate action potentials is completely gone.¹⁵ Vasoconstrictor is not present in topical anesthetics since it reduces mucosal permeability. To encourage dispersion inside the mucosa, topical anesthetics are additionally more concentrated than injectable anesthetics.

The objective of the current study, which involved 58 patients aged 18 to 60, was to determine if topical anaesthetic gels containing 2% lignocaine and 2% amitriptyline were

effective before local anaesthesia was administered. Number of female (60.3%) patients was more as compared to males (39.6%) in the group which was similar to study conducted by Nair

M et al referring to the fact that female suffer from more oral health problem as compared to male.¹⁶

In the current study the statistical significant differences were observed between the two groups at baseline , post injection and post operative at time while recording systolic blood pressure & WBFPRS. The significant differences were also observed at parameters like taste of acceptance, eye score and motor score. Results gives us conclusion amitriptyline is less effective as compared to lignocaine in playing role of topical anaesthesia . The results were similar to a study conducted by Lynch ME et al which showed that 2% amitriptyline failed to show efficacy in treating and controlling pain while doing procedures.¹⁷

While the current study was conducted on a limited sample size and for a brief period of time, the results cannot be extrapolated to the entire population. Also, due to the paucity of literature on comparing the two gels, the results were not compared with other data from the past.

Conclusion

From the present study, it was concluded that both lignocaine and amitriptyline perform well as a topical anesthetic gel before the placement of local anesthesia injection but the efficacy of amitriptyline gel is more as compared to lignocaine gel when compared on the basis of different parameters.

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