EFFICACY OF LIDOCAINE AND XYLOMETAZOLINE INTRANASAL SPRAY IN ANESTHETIZING MAXILLARY TEETH: AN OPEN LABEL RANDOMIZED CONTROLLED TRIAL

A RESEARCH THESIS SYNOPSIS

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By

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ABSTRACT

Background: The most common mode of anesthetizing maxillary teeth is by buccal mucosa infiltration by a needle, delivering local anesthetic to periapical tissues. Needle phobia is amongst the biggest fears for several patients seeking dental care. Such patients avoid dental visits and enter a vicious cycle of deteriorating oral health. Development of an injection-less anesthesia system is therefore of utmost importance for such patients.

Objectives: The objective of the present study is to assess the anesthetic efficacy of intranasal lidocaine and xylometazoline solution in anesthetizing maxillary non- molar teeth.

Methods: 60 patients will be randomly allocated to either intranasal lidocaine xylometazoline group or to control group after meeting the inclusion criteria. Patients randomized to intranasal group will then receive a single standardized dose (0.13 ml.) of 4% lidocaine and 0.1% xylometazoline delivered as an intranasal plume of mist. The second dose will be delivered after 4 minutes of the first dose. Anesthesia success will be assessed by standardized method. The operator will then penetrate dentin with a high-speed hand piece. If the patient feels any sensation of pain a third dose would be given. After waiting for a further ten minutes, cavity preparation would be continued again. If adequate anesthesia has still not been achieved, an injectable anesthetic in the form of lidocaine 1: 100,000 epinephrine (Huons Co. Ltd.) will be administered. The ability to complete the restorative procedure without the use of an injectable anesthetic would be considered as study drug success. Patients randomized to injectable anesthesia group will receive standard buccal infiltration anesthesia in the form of lidocaine 1:100,000 epinephrine.

SPSS v.21 will be used to analyze the data with level of significance set at $p<0.05$. Chi- square test will be used to see the difference in anesthesia success rates between two groups and any influence of tooth location or age group on the efficacy.

Key Words: Pain, lidocaine, xylometazoline, intranasal anesthesia, maxillary non-molar teeth.

CHAPTER 1: INTRODUCTION

1.1 Background

Pain is a result of stimulation of nociceptors that are sensitive to a noxious stimulus or a stimulus that will become noxious if prolonged. When this stimulus reaches the cerebral cortex, it may be perceived as pain. Pain is regarded as a fifth vital sign[1] and should be addressed according to that preference. Pain control is a prerequisite for any dental treatment offered and ideally starts at the pre-assessment visit.[2] An effective pain control regimen alleviates patient's discomfort, reduces dental anxiety and reinstates confidence on the clinician. An ideal pain control regime is the one that produces sufficient anesthesia to perform the procedure with least adverse effects, and is completely reversible.

Local Anesthesia is a state of local loss of sensation, without loss of consciousness, in a circumscribed area of the body due to a depression of excitation in nerve endings or an inhibition of the conduction process in peripheral nerves. The development of safe and effective anesthesia is amongst the most important advancements made in medical and dental practice.[3]

Many different techniques have been used to induce local anesthesia ranging from regional nerve blocks to simple infiltration techniques. The standard of care for providing pulpal anesthesia to maxillary anterior and premolar teeth is through buccal mucosa infiltration to

branches of anterior and middle superior alveolar nerves.[4] It is usually preceded by application of a topical anesthetic agent. Lidocaine and benzocaine are usually used as oral topical anesthetics. Their effects are limited to the control of painful stimuli occurring on or just beneath the oral mucosa.[5] However, there are a range of opinions on the effectiveness of topical anesthetics amongst the dental fraternity[6, 7]

Anesthetic agents may either belong to amide or ester class of drugs. Amides are generally safer than esters, have a rapid onset of action and moderate potency while esters have a higher incidence of sensitivity reactions.[8]

An ideal local anesthetic[9] should be non-irritating with little or no allergenicity. It should have a rapid onset and adequate duration of anesthesia. It should be completely reversible with minimum systemic toxicity. The anesthetic agent must also be selective to pain pathways.

Needle phobia is amongst a few fears ranked high in the category of phobias.[10] Needle phobic patients avoid dental appointments. Thus, avoidance from dental treatment aggravates the oral health environment and places a burden of health care on the community.[11] Simple measures like prior patient counseling, stating aims and objectives of therapy clearly, providing adequate pain control, behavior management and sedation may all help make the patient comfortable to dental treatment environment.[12]

Research is underway regarding development of ways to reduce needle discomfort and reduction in needle size. Newer methods of anesthesia delivery include CompuDent System,

Single Tooth Anesthesia System and Comfort Control Syringe.[13] These newer methods are aimed at precise location of delivery of the anesthetic, slower rate of injection and use of smaller needles to reduce pain and accompanying dental anxiety. However, anticipation of injection creates more anxiety than the injection itself,[14] therefore there is need for an injection less system to anesthetize the teeth for dental restorative procedures.

1.2 Literature Review

The development of local anesthesia began with the use of cocoa leaf, with authentic manuscript dating back to 1653 when cocoa was experimented for relief of toothache.[15] Cocaine, the active ingredient, was however isolated in 1860.[16] Cocaine began to be marketed as an anesthetic and analgesic until its adverse effects surfaced. Researchers than started a search for alternative drugs with better efficacy and least adverse effects. Novocaine was developed in 1905 and soon became a standard local anesthetic. However, it needed a higher concentration of adrenaline and reports emerged about allergenicity of the drug. During 1943-46, Lidocaine, an amide anesthetic emerged in the market and was praised for better anesthetic effects and less allergic reactions. Since then amides have emerged as leading anesthetic agents and innovations are underway to date.

Recently proposed theories of local anesthetic mechanism of action include membrane expansion theory and specific receptor theory, the latter one is the most favored today. According to this theory, local anesthetic molecules enter the nerve cell membrane, bind to specific receptors and prevent the influx of sodium ions leading to lack of membrane depolarization. Thus, the area infiltrated with local anesthetic agent is completely bathed with the drug and prevents the transmission of impulses to the central nervous system. The smaller nerve fibers are more readily blocked (which are predominantly nociceptors) followed by the larger nerve fibers. Therefore, sensation of pain is the first modality blocked, followed by the sensation of cold, warmth, touch and pressure.[17]

The most common mode of anesthetizing a maxillary tooth is by way of buccal infiltration anesthesia.[18] The procedure has a success rate of 93%.[19] It is usually preceded by topical application of a suitable local anesthetic so as to minimize the discomfort associated with injection.

Other modalities of anesthesia include anterior, middle or posterior superior alveolar nerve blocks. Anterior superior alveolar nerve supplies maxillary anterior teeth while middle superior alveolar nerve supplies maxillary premolars and usually mesio-buccal root of maxillary first molar. Middle superior alveolar nerve is present in only 72% of the population; when it is absent second premolar is supplied by posterior superior alveolar nerve.[3, 20]

Local anesthetic agents may either belong to amide or ester class of drugs. The most commonly used anesthetic agent in dentistry is lidocaine (an amide anesthetic). Other amide anesthetics include mepivacaine, prilocaine, bupivacaine, etidocaine, ropivacaine and levobupivacaine. Bupivacaine is a longer acting amide local anesthetic that is indicated for longer procedures or to provide adequate postoperative pain control in dentistry.[21]

Lidocaine has a rapid onset along with moderate potency and duration of action. It possesses minimum side effects as compared to ester anesthetics. Lidocaine is available in the market as a water-soluble salt as Lidocaine HCl with or without vasoconstrictor. It received FDA approval in 1948. Today Lidocaine is used as the standard of comparison for all local anesthetics.[22] It is metabolized in the liver and excreted via the kidneys as unchanged or in metabolized form.

Xylometazoline is a nasal decongestant drug which acts by binding to alpha-adrenergic receptors thereby producing vasoconstriction. It is applied as spray or drops into the nose to ease inflammation and congestion of the nasal pathways. It is available in strengths of 0.05% (for pediatric use) or 0.1% (for adult use).

Lidocaine xylometazoline combination is used as a topical anesthetic during flexible transnasal endoscopy, nasogastric intubation and during nasal fibreoptic procedures in department of otorhinolaryngology. The combination solution is aimed at increasing patient comfort, reducing the chances of epistaxis and prolonging the duration of anesthesia.[23] To date there is no published literature regarding the dental anesthetic effect of lidocaine xylometazoline combination.

Ester anesthetics include benzocaine, cocaine, procaine and tetracaine. Since benzocaine is highly insoluble in water, it is indicated for topical application, in a spray or gel form.
K305 is a combination of local anesthetic 3% tetracaine, used widely
in otolaryngology practice[24], and 0.05% oxymetazoline, a commercial over the counter decongestant. It has received FDA approval for use in June 2016.[25] It is administered
as an intranasal spray for obtaining sufficient pulpal anesthesia of maxillary non-molar teeth for dental restorative treatment on the ipsilateral side of drug administration. Success rates ranging between 83-90% have been reported for this product.[25] Success criteria was defined as the ability to complete the dental restorative procedure including clamp placement, cavity preparation, matrix placement and restoration.[3] Minor treatment emergent adverse effects of

the combination solution included nasal discomfort, rhinorrhea, nasal congestion and modest increases in Systolic and Diastolic blood pressures.

The criterion standard 2% lidocaine plus 1:100,000 epinephrine has a success rate of 93%.[19] The comparable success rates for the intranasal spray to conventional injectable local anesthesia is promising for use in needle phobic patients where a dental restorative treatment can be easily carried out without the need for an injection.

Lidocaine is easily available, cheaper and safer anesthetic as compared to tetracaine. On the other hand, esters have a higher incidence of sensitivity reactions[8] and have a propensity to cause methemoglobinemia if overdosed.[26] Due to these negative effects amides have surpassed esters in terms of popularity. Therefore, the aim of this study is to test the efficacy of lidocaine xylometazoline solution in achieving sufficient pulpal anesthesia to perform dental restorative procedures on teeth numbers 4 till 13.

1.3 Rationale of Study

The rationale of the study is to obtain local anesthesia by the help of an intranasal spray so that adequate anesthesia may be obtained for carrying out restorations on maxillary non-molar teeth without injection. It will be a breakthrough in local anesthesia in our clinical practice that will eliminate the need for an injection; especially for needle phobic patients.

1.4 Statement of Problem

Will lidocaine xylometazoline solution be efficacious in anesthetizing maxillary non-molar teeth for dental restorative procedures?

1.5 Objectives

To evaluate the efficacy of 4% lidocaine and 0.1% xylometazoline solution in anesthetizing Maxillary non-molar teeth for dental restorative procedures.

1.6 Hypotheses

H_0: There will be no difference in anesthetic efficacy between 4% lidocaine 0.1% xylometazoline solution and injectable local anesthesia.

H_a: 4% lidocaine and 0.1% xylometazoline solution will be more efficacious than injectable local anesthesia in anesthetizing maxillary non-molar teeth for restorative dentistry.

1.7 Operational Definitions

PAIN: Pain is an unpleasant sensory and emotional experience that is associated with actual or potential tissue damage, or that is described in terms of such damage.

ANESTHESIA: Refers to artificially induced loss of ability to feel pain, that is done to permit the performance of surgery or other painful procedures.

MAXILLARY NON-MOLAR TEETH: Include maxillary incisors, canines and premolars.

VISUAL ANALOG SCALE (VAS):

A **Visual Analogue Scale** (**VAS**) is a measurement tool that intends to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. It is often used in epidemiologic and clinical research studies to measure the intensity or frequency of various subjective symptoms.

ICDAS CRITERIA:

ICDAS (International Caries Detection and Assessment System) is a simple, logical and evidence based system for detection and classification of dental caries. It is based on scores ranging between 0-6 depending upon the extent of carious lesion.

CODE	DESCRIPTION
0	SOUND TOOTH STRUCTURE
1	FIRST VISUAL CHANGE IN ENAMEL
2	DISTINCT VISUAL CHANGE IN ENAMEL
3	LOCALIZED ENAMEL BREAKDOWN
4	UNDERLYING DARK SHADOW FROM DENTIN
5	DISTINCT CAVITY WITH VISIBLE DENTIN
6	EXTENSIVE DISTINCT CAVITY WITH VISIBLE DENTIN

CHAPTER 2: METHODOLOGY

2.1 Study Design:

Open Label Randomized Controlled Trial.

2.2 Study Setting:

Department of Operative Dentistry, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, DUHS, Karachi.

2.3 Study Duration:

The study will be completed within six months from the date of synopsis approval.

2.4 Study Population:

2.4.1 INCLUSION CRITERIA:

- Adults aged 18-40 years.
- Vital maxillary premolar, canine or incisor.
- Class 1,2,3,4 or 5 restorations.
- Heart rate between 55 and 100 beats per min.
- Seated Systolic blood pressure between 95 and 150 mm Hg and diastolic blood pressure between 60 and 100 mm of Hg.
- No radiographic evidence of pulpal or periapical pathosis and
- ICDAS caries detection score of 4,5 or 6.

2.4.2 EXCLUSION CRITERIA:

- Upper respiratory tract infection.
- blood pressure more than 150/100 mm Hg.
- a pulse higher than 100 beats or lower than 55 beats per min.
- uncontrolled thyroid disease.
- a known allergy to any of the components used in the solution.
- Pregnant or breast feeding patients.
- Those having 5 or more nosebleeds per month.
- Received any local anesthetic/analgesic within 24 hrs. of study drug administration.
- Teeth with pulpal diagnosis of irreversible pulpitis.
- ICDAS score of less than 4.

2.5 Sample Size:

Total 60 patients will be enrolled in the study. Using PASS v11, 2-sample independent proportion with 99% power of test and confidence interval, 88% success rate of tetracaine[3], 28% success rate of placebo[3], sample size calculated is 28 each group which I have increased up to 30 each group.

2.6 Sampling Technique:

Consecutive sampling will be done for the study participants who fall within the inclusion criteria. 30 patients will be randomized each to lidocaine xylometazoline or control group.

Randomization: Randomization will be done with lottery method.

2.7 Data Collection Procedure:

After taking thorough medical, dental history and performing intraoral, extraoral examination, if the patient requires a dental restorative procedure on teeth numbers 4 to 13 (maxillary non-molar teeth) having ICDAS score 4,5 or 6, he/she will have pulp vitality testing and periapical radiograph done. If the patient falls within the inclusion criteria, he/she will be explained about the procedure, efficacy and safety of the materials used, possibility of receiving either treatment options (i.e. intranasal spray or injectable local anesthesia), the patient will be asked to sign a consent form (Appendix I).

The researcher would conduct an alcohol sniff test, to assess baseline olfactory sensation of the patient, by placing a pad of 70% isopropyl alcohol beneath the nostril ipsilateral to the tooth to be treated. The research participant would then close his/her eyes and the contralateral nostril while inhaling through the other nostril. The alcohol pad would be placed at 30 cm from the nostril and with each expiration will be moved closer by 1-2 cm to ascertain at what distance does the patient sense the odor. Patient with normal olfactory function would sense it at 14 centimeters(cms.) while one with reduced olfactory sensation would sense it at approx. 8 cms.

The research participants will then be randomized into two groups. Group A will receive 4% lidocaine and 0.1% xylometazoline solution while Group B will receive injectable local anesthesia.

For Group A participants, the researcher would then administer a single puff of the intranasal spray while the patient sits upright in the dental chair with the device positioned inside the nostril up to the edge of the nasal valve. The dose will then be given with a single puff as a plume of mist. The second spray is delivered approx. 4 minutes after the first one with the tip of the spray positioned at 45 degrees to the horizontal.

The operator will wait for 10 minutes and then assess anesthesia by probing the soft tissue adjacent to the tooth hand and reading will be taken on the VAS. If the VAS reading is 0, the cavity preparation procedure will begin. If the VAS reading is more than 0, a third dose of the intranasal spray will be delivered in a similar fashion as the second one. The operator will wait further ten minutes before beginning to use hand piece again. VAS reading will be taken again at this moment. If the patient still experiences any sensation of pain (VAS reading more than 0), the procedure will be halted and standard buccal infiltration anesthesia will be given with 2% lidocaine with 1: 100,000 epinephrine (Huons Co. Ltd.). The need for a rescue injectable local anesthetic will be considered as study drug failure. The ability to carry out the restoration after 2 or 3 sprays will be considered as the study drug success.

For Group B participants, anesthesia will be achieved by the help of injectable local anesthetic.

After achievement of effective anesthesia, the cavity preparation would be done as per standard recommendations. The tooth will be isolated with rubber dam and restored with amalgam or VLC (visible light cured composite) as per the treatment plan agreed with the patient.

After completion of the procedure, the patient will be given standard post-operative instructions and will be recalled for finishing and polishing procedure at 24 hours. After satisfactory outcomes, the patient may be discharged with postoperative instructions and re emphasis on oral hygiene.

2.8 Data Analyses

2.8.1 Study Variables

Dependent Variable: Efficacy in achieving anesthesia.

Independent Variable: Two different anesthetic agents (intranasal spray or injectable local anesthetic), Age, Gender, Tooth Location, ICDAS score.

2.8.2 Statistical Analyses:

Data will be analyzed using SPSS v.21. Descriptive statistics will be calculated for continuous variables like age, ICDAS score etc. in the form of mean and standard deviation while descriptive statistics for categorical variables like gender, tooth location etc. will be calculated as frequency and percentages. Chi-square test will be applied to see the difference of efficacy among the two groups and any influence of tooth location or age group on the efficacy. A p-value of 0.05 or less will be considered as significant.

2.9 Ethical considerations

The present study will be non-offensive and secure for the participants. Participants will be selected on volunteer basis and informed consent is mandatory to be understood and signed. The participants' data will be kept confidential. The participants will not be forced to continue the study if they are willing to quit. Conclusive results will be disclosed to the patients once the study has completed. The agents used in this study are safe and carry a good safety profile. Lidocaine and xylometazoline are routinely used in otorhinolaryngology department for topical anesthesia of the nasal cavity and pharynx.

2.10 Study Time Line

S.NO	WORKING STEPS	TIME (MONTHS)						
		1	2	3	4	5	6	7
1.	Synopsis writing and approval							
2.	Data collection							
3.	Data processing							
4.	Thesis writing							

2.11 Budget:

All the expenses incurred on the study will be borne by the researcher himself. The details are mentioned below:

S.NO.	**Item**	**Manufacturer**	**No. Of Items Required**	**Cost per Item (Rs.)**	**Total Cost (Rs.)**
1.	**Plastic Gloves**	**Safety Co. Ltd.**	**02 packs**	**50**	**100**
2.	**Latex examination gloves**	**Safety Co. Ltd.**	**04 boxes**	**450**	**1800**
3.	**Face mask**	**Universal Dental**	**04 boxes**	**150**	**600**
4.	**Alcohol swabs**	**Safety Co Ltd.**	**01 box**	**300**	**300**
5.	**Normal saline**	**Searle**	**01 pack**	**60**	**60**
6.	**Lidocaine solution**	**Barrett Hodgson Pak. Ltd.**	**60 bottles**	**50**	**3000**

7.	**Xylometazoline HCl solution**	**Zafa pharmaceuticals**	**60 bottles**	**50**	**3000**
8.	**Lidocaine injectable anesthetic**	**Huons Co Ltd.**	**02 packs**	**1300**	**2600**
9.	**Anesthetic plungers**		**03**	**500**	**1500**
10.	**Examination sets**		**05**	**350**	**1750**
11.	**Rubber dam kits**		**03**	**2000**	**6000**
12.	**Rubber dam clamps**		**03 sets**	**500**	**1500**
13.	**Dental floss**		**02 packets**	**100**	**200**
14.	**High speed handpieces**		**02**	**10000**	**20000**
15.	**Low speed handpieces**		**02**	**15000**	**30000**
16.	**High speed handpiece carbide burs (round)**		**01 packet**	**3500**	**3500**
17.	**High speed handpiece carbide burs (straight fissure)**		**01 packets**	**3500**	**3500**
18.	**Low speed handpice round burs**		**03 packets**	**1000**	**3000**
19.	**Suction tips**		**02 packets**	**350**	**700**
20.	**Disposable glasses**		**02 packs**	**200**	**400**

21.	**Sterilization pouches (medium sized)**	**Top Dent**	**02 packs**	**600**	**1200**
22.	**Sterilization pouches (small sized)**	**Top Dent**	**01 pack**	**400**	**400**
23.	**Instrument disinfection solution**	**Gigasept**	**01 bottle**	**3000**	**3000**
24.	**Loose cotton**		**01 pack**	**150**	**150**
25.	**Cotton rolls**		**05 packs**	**50**	**250**
26.	**Plastic instruments**		**05**	**60**	**300**
27.	**Condensers**		**05**	**60**	**300**
28.	**Burnishers**		**05**	**60**	**300**
29.	**Kite shaped carvers**		**05**	**60**	**300**
30.	**Articulating papers**	**Henry Schein**	**4 packs**	**25**	**100**
31.	**Calcium hydroxide liner**	**Dentsply**	**01 pack**	**2200**	**2200**
32.	**Dycal applicators**		**05**	**80**	**400**
33.	**Amalgam alloy**	**ANA 2000**	**02**	**2500**	**5000**
34.	**Mercury**		**02 bottles**	**1100**	**2200**
35.	**Lining GIC**	**3M ESPE**	**01 pack**	**2650**	**2650**
36.	**Cavity varnish**		**01**	**2000**	**2000**
37.	**Etchant**	**3M ESPE**	**02 bottles**	**1200**	**2400**
38.	**Bonding agent**	**3M ESPE**	**01 bottle**	**6500**	**6500**
39.	**Flowable composite**	**3M ESPE**	**02 syringes**	**3500**	**3500**
40.	**Packable composite** **A1 shade (body)** **A1 shade (enamel)** **A1 shade (dentin)**	**3M ESPE**	 **01** **01** **01**	 **2000** **2000** **2000**	**18000**

	A2 shade (body) **A2 shade (enamel)** **A2 shade (dentin)** **A3 shade (body)** **A3 shade (enamel)** **A3 shade (dentin)**		**02** **01** **01** **01** **01** **01**	**2000** **2000** **2000** **2000** **2000** **2000**	
41.	**Curing light**		**01**	**10000**	**10000**
42.	**Composite finishing bur (long tapered fissure)**		**02 packs**	**1000**	**2000**
43.	**Mylar strips**	**Henry Schein**	**01 pack**	**350**	**350**
44.	**Matrix bands**	**Henry Schein**	**06 packets**	**450**	**5400**
45.	**Tofflemire retainers**		**05**	**220**	**1200**
46.	**Wedges**		**01 packet**	**850**	**850**
47.	**Finishing and polishing kit**	**3M ESPE**	**01**	**3500**	**3500**
48.	**Polishing brushes**		**100**	**50**	**5000**
49.	**Rubber dam sheets**	**3M ESPE**	**03 packets**	**800**	**2400**
					159660

CHAPTER 4: REFERNCES AND APPENDICES

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Appendix I

CONSENT FORM

Research Title: EFFICACY OF LIDOCAINE AND XYLOMETAZOLINE INTRANASAL SPRAY IN ANESTHETIZING MAXILLARY TEETH: AN OPEN LABEL RANDOMIZED CONTROLLED TRIAL.

1. Introduction of principal investigator: Dr. Umair Wahid, Lecturer & MDS trainee in Department of Operative Dentistry at Dr. Ishrat Ul Ebad Khan Institute of Oral Health Sciences.

2. Information about research : This study is being conducted to assess the efficacy of lidocaine and xylometazoline intranasal spray in anesthetizing maxillary non-molar teeth.

3. Research procedure: The research involves intranasal administration of anesthetic spray in order to anesthetize maxillary non molar teeth. A total of 3 sprays would be given by spray bottle at specific intervals. If anesthesia is found to be effective the restorative procedure would be started. If not, conventional anesthesia by means of an injection would be given.

4. Possible Risks and benefits: There are no known risks associated with any of the materials being used in this research. The materials used are already in clinical practice in department of ear, nose & throat (E.N.T). **Possible benefits:** This study will help us devise a method to provide needle less anesthesia to patients.

5. Rights of the participant: Participants are empowered to withdraw from the study at any time during the study time period and that there will be no penalties upon withdrawal. The level of care would not be affected if the participant decides to withdraw from the study.

6. Confidentiality: All the data and personal information obtained from the participants will be kept confidential.

7. Contact Info: Dr. Umair Wahid. Department of Operative Dentistry, DIKIOHS, Dow University Ojha Campus, Suparco Road, KDA Scheme 33 Karachi. Further details may be sought by calling on 0331-2351078 between 9am-2 pm.

You are welcome to contact the investigator if you have any questions.

Declaration of consent : I confirm that I _____understand the information which has been provided to me. I also understand that my participation is voluntary, and that I can withdraw from the study at any time without giving any reasons. I have also been assured that my medical care will not be affected by my withdrawal from the study.

Signature/ Thumb Impression of the participant: Signature of witness:

Signature of Principal Investigator: Date:

APPENDIX III

DATE: _____ PATIENT NO: _____GROUP: _____

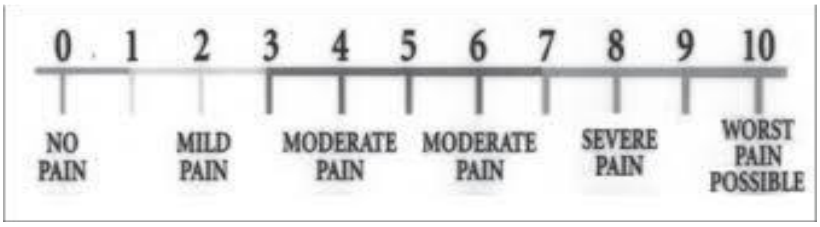
PATIENT'S NAME (OPTIONAL): _____ AGE: _____ SEX: _____

ADDRESS: _____

CONTACT NO: _____ TOOTH NO: _____ ICDAS SCORE: _____

ALCOHOL SNIFF TEST RESULT (IN CENTIMETERS.)

_____



1. NUMBNESS OF MUCOSA
    a. EFFECTIVENESS (YES/NO)
    b. VAS READING _____

2. EFFECTIVENESS OF SPRAY ANESTHESIA
    a. SPRAY 1 & 2
        i. EFFECTIVENESS (YES/NO)
        ii. VAS READING _____
    b. SPRAY 3
        i. EFFECTIVENESS (YES/NO/NA)
        ii. VAS READING (IF APPLICABLE) _____

3. USE OF AN INJECTABLE LOCAL ANESTHETIC

    YES NO

4. ANY TREATMENT EMERGENT ADVERSE EFFECTS

_____