Comparative Evaluation of Analgesic Effect of Articaine Hcl and Lidocaine Hcl in Pediatric Dental Patients

V. Ranjith Akshay Seshadri,
Postgraduate student
Saveetha institute of medical and technical sciences, Saveetha dental college and hospital,Poonamallee,Chennai

Ganesh J
Reader,Saveetha Institute of Medical and Techical sciences, Saveetha dental college and hospital,Poonamallee,Chennai

Sahana Kritivasan,
Post Graduate Student, M.M. College of Dental Sciences and Research, Mullana Ambala Haryana

Abstract
Introduction: Local anaesthesia is the temporary loss of sensation without depressing the level of consciousness. Drug administration: An important consideration in Paediatric patient behaviour guidance.This can help patients have a positive experience during administration of local anaesthesia and avoid fear and anxiety in adolescence.
Aim: Compare the anaesthetic effect of 2% Lidocaine used for Inferior Alveolar Nerve Block and 4% Articaine used for Buccal Infiltration by assessing the pain perception of Children undergoing Pulpectomy procedure in Mandibular 2nd Primary Molars
Materials And Method: 38 patients were chosen, aged between 4-8 years. Randomisation done and were categorised into Group A (articaine administration) and Group B (lignocaine administration). Inclusion criteria: mandibular 2nd molars indicated for pulpectomy , no inflammatory lesions. Injection methods used: Articaine: 4% articaine and 1:1,00,000 epinephrine on the buccal vestibule and in the Lignocaine: 2% with 1:80,000 epinphrine for IANB and Pain was assessed using Wong baker: 6 faces
Results: the results of the present study stated that the articaine group had 7 (36.84%) patients reporting pain and 12 (63.16%) no pain, while in the lidocaine group, 11(57.89%) patients reported pain and 8 (42.10%) no pain ($p<0.05$)
Conclusion: It is conclusive that 4% articaine has a comparable anaesthetic outcome with 2% lidocaine IANB during pulp therapy of the second primary mandibular molars.

INTRODUCTION :

Pain is defined as an unpleasant sensory and emotional experience by the patient due to various reasons. The common causes pain are irritation to the pulp and periapical changes. Iatrogenic reasons of pain are due to needle prick or extraction of teeth. The injection of local anaesthetic agent is the greatest source of fear anxiety especially in children as it is associated with discomfort and pain.[(1)] Perception of pain varies in anxious patients. Hence the use of local anaesthesia was introduced to eliminate the pain during dental treatments.[(2)] Local anaesthesia can be defined as the loss of sensation in a circumscribed area of the body caused due to the depression of excitation of the nerve endings or an inhibition if the conduction

process of the peripheral nerves. These cause a temporary loss of sensation, without depressing the level of consciousness. LA in children are mainly used for topical application on the peripheral nerve endings of IV to neuraxial use for regional anaesthesia. (3)

Drug administration is an important consideration in Paediatric patient behaviour guidance. Hence appropriate method of pain control is of atmost importance and vital for a successful pediatric dental care. This can help patients have a positive experience during administration of local anaesthesia and avoid fear and anxiety in adolescence.

Local anaesthetic agents are broadly of two groups based on the ester and amide chains present. The amide group contains of prilocaine, bupivacaine, lidocaine, levobupivacaine, mepivacaine, ropivacaine and etidocaine , while the ester group contains tetracaine, choloroprocaine and procaine. Of this the amide group is only commonly employed in the day to day practise of the pediatric dentistry. (4) The mechanism of action of LA are majorly to reversibly block the action potentials of the nerves that create conduction impulses along the axons carrying motor or sensory signals. This is done with the help of voltage gated sodium channel that are selectively blocked by the ionized weak bases.

Lignocaine HCl is considered to be the "Gold Standard" agent widely used. It belongs to the amide group with intermediate potency and duration of action. It is also aa soluble surface anaesthetic agent. Articaine HCl has a rapid onset (45sec- 90 secs), short acting (10-20 mins)and a better diffusion into soft and hard tissues, leading to much more effective anaesthesia.

Most common method of administration for mandibular molars is the IANB block, which can cause soft tissue damage during the position change to access the lingual branch. Hence to avoid such injuries the use of infiltration techniques to provide better anaesthesia was evaluated.

Hence the aim of the current study was to compare the anaesthetic effects exerted by 2% Lidocaine used for inferior alveolar nerve block and 4% Articaine on buccal infiltration on perception of pain in children during pulpectomy of mandibular 2nd primary molars.

MATERIALS AND METHODOLOGY

A randomised split mouth study was done in which 38 children aged between 4-8 years old who reported to the outpatient department of pediatric dentistry of Saveetha Dental College and Hospitals, Chennai were chosen. These patients who had to undergo bilateral pulpectomy procedure in the 2nd mandibular molar without any periapical lesions with a positive behaviour rating based on the Frankl Behaviour rating scale were recruited after obtaining informed consent from the parents. Medically compromised patients and with definitely negative behaviour and previous experience of anaesthesia were excluded from the study.

The children were then randomly assigned into two groups:

- Group A(articaine administration)
- Group B (lignocaine administration)

Injection methods was used:

- Group A : 2.5 ml of 4% articaine with 1:1,00,000 epinephrine was deposited in the buccal vestibule as part of the infiltration technique after application of topical anesthesia.
- Group B : 2.5 ml of 2% Lignocaine with 1:80,000 epinephrine was deposited after piercing through the coronoid notch after obtaining bony hit just at the level of occlusion for IANB

The use of topical anaesthesia

The patients pain levels were assessed using Wong Baker face test, Modified Behavior

Pain Scale and VAS scores were recorded that were statistical analysed using SPSS software version 26.

RESULTS:

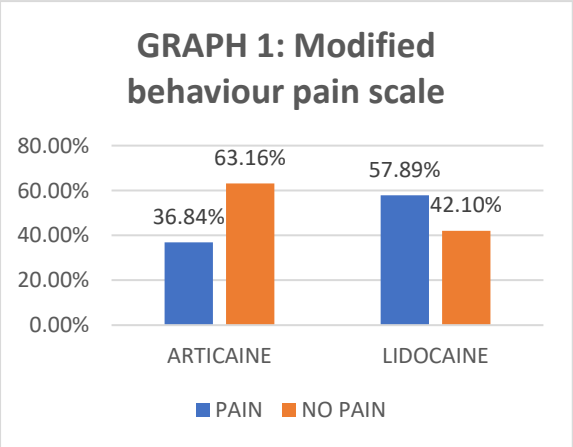
	BUCCAL INFLITRATION	INAB	p- value
During Injection	**5.40**	**8.16**	**0.002***
During Pulpectomy	**4.28**	**7.39**	**0.087**

Table 1: Wong Baker face test mean score during injection and pulpectomy

Table 2 : VAS mean score

	BUCCAL INFLITRATION	INAB	p- value
During Injection	**4.20**	**7.92**	**0.006***
During Pulpectomy	**5.18**	**7.67**	**0.065**

The study participants comprised of 14 boys and 20 girls aging between 4–8 years (mean = 6.52 ± 0.99). Results of Wong Baker face test, Modified Behaviour Pain scale and VAS scores during the injection and pulpectomy procedures were evaluated using the independent t-test. The mean Wong Baker score and VAS score for the buccal infiltration was 5.40 and 4.20 and for the INAB technique was 8.16 and 7.92 respectively. The difference in the pain scores during the injection procedure on Wong Baker and VAS were observed to be statistically significant ($p < 0.05$) while that for the pulpectomy procedure were statistically insignificant ($p > 0.05$).



In the Modified behvaiour pain scale the articaine group had 7 (36.84%) patients that reported pain and 12 (63.16%) no pain, while in the lidocaine group, 11(57.89%) patients reported pain and 8 (42.10%) no pain ($p<0.05$).

DISCUSSION:

Managing dental pain with appropriate methods helps to better treatment outcomes and good attitude of the patient towards the dental treatment.[5] Local anaesthesia is the most common and safest method of pain control used in the day to day practise of dentistry. In this study efficiacy of 4% articiane as a infiltration when compared with 2% lidocanine as a INAB was done and the pain rating was done during injection and during treatment.

Pain perception caries from person to person and depends on various factors that elevate or reduce the pain levels and are unreliable especially in children. There are various modalities that have been used to describe and assess the pain experienced by the patient like VAS, Wong Baker, FPS, Shmidt pain index, VRS but a valid evaluation of

the pain experience is always subjective and met with difficulties during the clinical practice. Donna Wong and Connie Baker instituted the Face Pain Scale. This scale represents the various faces that attribute to the pain experience of the patient and the health care professionals are obligated to describe the pain intensity associated with each of the face and the patient states the best suited face for them. In children they are encouraged to identify the face that portrays their pain at the moment during the injection and also during the procedure that best suits them.[6,7]

The composition of a Local anesthethia is that it has a local anaesthetic agent which an esther or amide base, a vasoconstrictor that reduces the blood flow to the site of injury to reduce and control the bleeding in that site. Slows down the absorption of LA into the cardiovascular system thereby reducing the risk of LA toxicity. It also increases the duration of action. The reducing agents like sodium metabisulfite helps in preventing the oxidising of the vasoconstrictor that is the epinephrine. Preservatives like methyl paraben and caphrylhydrocuprientoxin provides stability to the modern LA solution. Thymol acts as a fungicide and modified ringer's solution acts as a vehicle. [8]

Infiltration techniques in the mandibular molar regions for pulpectomy procedures proves to be a better way than the conventional methods of INAB as they are less painful and extent of soft tissue injury are less. [9] In the present study the pain experienced by the study participants receiving 4% articaine infiltration was much lower than by those received 2% lidocaine for INAB. Acoording to Ramadurai et al in 2019 2% atricaine with 1:2,00,000 concentration does not demonstrate superiority than 2% lignocaine in clinical effectiveness.[10] According to Fan et al in 2008 the usage of 1.7 mL of Articaine HCl for inducing palatal anesthesia affords equivalent effectiveness to the classic route. [11] Articaine is different from the conventional lidocaine that is used as it is derived from thiophene and not benzene that helps in greater solubility in lipids. This helps in increasing the diffuse ability through the nerve sheath and thereby by allowing shorter potency. Binding degree of the anesthetic molecules to the surface membrane of the nerve dictates the duration of actin of the anesthetic agent. According to Courtney et al with a more secure bond the anesthetic agent is released more slowly from its receptor sites and that 90% of the nerve membrane is made up of lipids. [12]

Articanine is delivered as a 4% solution where as lidocaine is only used in 2% this is due to the toxic local metabolite involved in it that may manifest the toxicity simply due to the concentration variation.[13] The half life elimination of articanine is 20 mins whereas for lidocaine it is approximately somewhere close to 90 mins.

The location of mandibular foramen and canal also places an important role in the effectiveness oof the anesthetic agent. According to J.P.C et al presence of anterior loop in the mental nerve is quite common and safe margin should be practiced to avoid any complications.[14]

Articaine is metabolized in the blood and only 5-10% in the liver due to the extra ester linkage that is present in the articanine molecule whereas 70% if lidocaine is metabolized in the liver and any systemic condition involving the liver and CVS is an contradiction for the use of lidocaine.[8] The major product of metablosim of articaine is articainic acid that is an inactive and weak acid. Lidocaine is metabolised to monoethyl glyciene and xylidide which are active

products and toxic. It has a rapid onset of 2-3 mins. Articanine is a high potency long duration acting drug that produces 45 mins of pulpal anaesthesia at low concentrations itself.

CONCLUSION:

According to results of the present study, buccal infiltration with 4% articaine used for buccal inflitration has a comparable anaesthetic effect and outcome with that of 2% lidocaine used for IANB during pulp therapy procedure of the second primary mandibular molars. However, further studies are needed to replace this method in the mandibular area.

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