

Assessment of efficacy of Articaine and Lignocaine in patients undergoing dental extraction a comparative study

Hemanth Kumar H.R.^{1,*}, Vinuta Hegde², Rakesh Sharma³, Chandrakala T.P.⁴

¹Assistant Professor, ²Junior Resident, Dept. of Dentistry, Karwar Institute of Medical Sciences, Karwar, ³Clinician, Dept. of Oral Medicine & Radiology, Orocare, Bangalore, ⁴Dental Health Officer, Community Health Centre, Bellur

***Corresponding Author:**

Email: dr_hemanth82@yahoo.com, kr7514915@gmail.com

Abstract

Introduction: The most commonly used local anesthetic agent for dental extraction is lignocaine. Articaine has been used as an alternative local anesthetic in dentistry for more than 20 years. The present study was undertaken to compare anesthetic efficacy of 4% Articaine hydrochloride versus 2% Lignocaine hydrochloride during extraction of mandibular molar.

Materials and Method: The present study was conducted in the Department of Dentistry, Karwar Institute of Medical Sciences, Karwar. In this study 50 patients were enrolled and were divided into Group A (lignocaine) and Group B (Articaine) of 25 each. Patients included aged between 20-50 years. Extraction of teeth was done and time of onset of anesthesia, duration of anesthesia and pain were recorded. Data was analysed by SPSS software.

Results: In this study a total of 50 subjects undergoing extraction of mandibular molars were enrolled. There were 27 males and 23 females in this study. The mean age of males was 32.15 +/- 1.45 years and females were 30.42 +/- 2.37 years. The mean onset time and standard deviation of anesthesia for Group A was 2.5 +/- 0.41 minutes and 1.8 +/- 0.42 minutes for Group B which showed a non significant difference with p-value of greater than 0.05. The mean and standard deviation of duration of anesthesia for Group A and Group B were 3.1 +/- 0.3 hours and 4.5 +/- 0.2 hours respectively

Conclusion: The duration of anesthesia is longer with Articaine as compared to Lignocaine but there is no difference in the level of pain and time of onset of anesthesia.

Keywords: Anesthesia, Articaine, Extraction, Lignocaine, Pain

Introduction

Pain is an unpleasant feeling often caused by a noxious stimuli and dental extraction is usually associated with great deal of pain and anxiety. Postoperative pain is generally short lived with varying intensity. Initially it is severe with the peak of pain experienced after a few hours and then subsiding as the healing takes place.⁽¹⁾ The increasing intensity of post operative pain correlates with the decreased effects of the local anesthesia at about 2-3 hours following surgery.⁽²⁾ It is also associated with increasing levels of prostaglandins in tissues surrounding the surgical sites. Therefore long lasting local anesthesia with fast onset may provide the patient with better postoperative analgesia.

The first substance that was used for local anesthesia was cocaine, as far back as in 1884. In 1903, Braun suggested using adrenaline as a "chemical tourniquet" to prolong the duration of local anesthesia. Lignocaine with the chemical formula 2-Diethylamino 2',6'-acetoxylidide hydrochloride is the first non-ester type of local anesthesia synthesized by Lofgren in 1943 and still is the most frequently used anesthesia agent in dentistry. It is an amide anesthesia with a short onset of action (2-3 minutes) and an intermediate duration of anesthesia (60 minutes at pulpal level, 180-300 minutes in soft tissues) when associated with adrenaline. Due to its potency, safety and effectiveness, lignocaine has become the gold standard for comparison among the newer agents.⁽³⁾ On the other hand, Articaine has been

used as an alternative local anesthesia in dentistry for more than 20 years. Articaine is 4-methyl-3-[1-oxo-2-(propylamino)-propionamido]-2-thiophene-carboxylic acid, methyl ester hydrochloride, amide type of local anesthesia, introduced in 1969 by Rusching et al with the name of articaine and is used clinically in 4% concentration. It has very fast onset of action, excellent quality of anesthesia, very low immunogenic potential, better diffusion properties and a low degree of toxicity as compared to Lignocaine.⁽³⁾ The present study was undertaken to compare anesthetic efficacy of 4% Articaine hydrochloride versus 2% Lignocaine hydrochloride during extraction of mandibular molar.

Materials and Method

The present study was conducted in the Department of Dentistry, Karwar Institute of Medical Sciences, Karwar for a period of 3 months (August 2015 to November 2015). In this comparative study a total of 50 patients were enrolled. The entire sample was divided in two groups (25 patients in each group) namely, Group A and Group B, irrespective of gender, caste and socio-economic status. The study was approved by the Institutional ethical board, the patients were informed and a written informed consent was obtained in patient's vernacular language. In this study patients aged between 20-50 years of age belonging to ASA (American Society of Anesthesiologists) I or II category were included. Any medically compromised patient, patient with allergy to local anesthesia,

pregnant, lactating mothers and patients who underwent transalveolar extraction were excluded from the study.

Procedure: Under aseptic condition, extra oral and intraoral scrubbing of the site was done with betadine (0.5%) solution. Patients were draped with sterile sheets. They were asked to rinse with chlorhexidine mouthwash (0.12%). Classic Inferior Alveolar Nerve Block was given following the standard anatomical landmarks and technique as per Malamed 2004. For Group A 1.7 ml of 2% Lignocaine with 1:100000 epinephrine anesthetic solution was administered to block the inferior alveolar nerve and lingual nerve. For Group B 1.7 ml of 4% Articaine with 1:100000 epinephrine anesthetic solutions were administered to block the inferior alveolar nerve and lingual nerve. Long buccal nerve was anesthetized by administering 0.5ml from second disposable syringe for both the groups. Elevation of the mucoperiosteal flap was done by Molt's periosteal elevator which was followed by extraction of teeth using mandibular molar forceps. At the end of procedure patients were asked to rate the intra-operative pain on 10 point Visual Analogue Scale (VAS) where 0 indicates no pain and 10 indicates severe pain.

The time of onset of anaesthesia was calculated by recording the time elapsed from full needle withdrawal until the patient referred first evidence of subjective symptoms for mandibular injections that is tingling, numbness of lower lip and numbness on tip of the tongue on ipsilateral side. Objective signs are checked using shepherd probe. The duration of anaesthesia was calculated from the time of injection till the patient reported loss of numbness over lower lip or tip of tongue and was recorded through questionnaire method. The depth of anaesthesia was recorded through VAS both intra operatively and 2 hours after procedure. All the data was tabulated and analysed using SPSS software. Chi square test and student t test were used for analysis. P value of less than 0.05 was taken as significant.

All the patients were prescribed capsules Amoxicillin 500mg TID and Tablets Diclofenac Sodium 50mg TID as a standard anti-infective and analgesics for a period of 5 days post operatively.

Result

In this comparative study a total of 50 subjects undergoing extraction of mandibular molars were enrolled. There were 27 males and 23 females in this study. The mean age of males was 32.15 +/- 1.45 years and females were 30.42 +/- 2.37 years.

The mean onset time and standard deviation of anesthesia for Group A was 2.5 +/- 0.41 minutes and 1.8 +/- 0.42 minutes for Group B which showed a non significant difference with p-value of greater than 0.05 as seen in Table 1.

Table 1: Time of onset of anaesthesia

Groups	Mean onset time (minutes)	Std. Deviation
Group A (lignocaine)	2.5	.41
Group B (Articaine)	1.8	.42

p value >0.05

Table 2 depicts the duration of anesthesia. The mean and standard deviation of duration of anesthesia for Group A and Group B were 3.1 +/- 0.3 hours and 4.5 +/- 0.2 hours respectively. The difference was statistically significant (p < 0.05) giving an inference that the Articaine has longer duration of anesthesia compared to that of Lignocaine.

Table 2: Duration of anaesthesia

Groups	Mean duration of anesthesia (in hrs)	Std. Deviation
Group A (lignocaine)	3.1	.3
Group B (Articaine)	4.5	.2

p value <0.05

Table 3 shows the mean VAS scores of intraoperative pain that is 1.15 +/- 0.61 for Group A and 0.81 +/- 0.73 for Group B with p value of >0.05 which is statistically not significant and the mean VAS score at 2 hours postoperatively was for Group A was 2.42 +/- 0.47 and for group B was 2.61 +/- 0.48 which showed a non significant difference with p value of >0.05. We included VAS evaluation for efficacy analysis.

Table 3: Depth of anaesthesia

	Groups	Mean	SD
Intra operative	Group A	1.15	.61
	Group B	.81	.73
At 2hr	Group A	2.42	.47
	Group B	2.61	.48

p value > 0.05

Discussion

The local anesthetic Articaine hydrochloride has been widely used for dental anesthesia in Europe and Canada for more than decades. It inhibits nerve conduction by decreasing the sodium ion influx that initiates a peripheral nerve's action potential. It is unique among available amide local anesthesia's because it is based on a thiophene ring containing a methyl ester side linkage that contributes to Articaine's rapid conversion to articainic acid, its primary metabolite.⁽⁴⁾ It makes Articaine more lipophilic which is responsible for its diffusion properties within tissues and bones resulting in faster onset of action compared to Lignocaine.⁽⁵⁾ According to Malamed et al⁽³⁾ the time of onset of 4% Articaine in mandibular inferior alveolar nerve block was 2-2.30 minutes. Mean time of onset

reported by Sierra-Rebolledo A. et al⁽⁶⁾ was 56.03 seconds for Articaine versus 75.04 seconds for Lignocaine. Martinez-Rodriguez N et al⁽⁷⁾ reported a time of onset of 1.04 min and 3.75 min respectively for Articaine and Lignocaine. Another study done by Costa et al⁽⁸⁾ 1:100000 epinephrine formulation of 4% Articaine appeared to have slightly shorter onset. Their results coincide with our results in establishing latency period for Articaine and Lignocaine that is 2.20 min for 2% Lignocaine and 1.90 min for 4% Articaine and is statistically insignificant.

Unlike other amide local anesthetics Articaine undergoes biotransformation in both liver (hepatic microsomal enzymes) and plasma (hydrolysis by plasma esterase).⁽⁵⁾ About 90% of Articaine metabolizes quickly via hydrolysis in the blood into its inactive metabolite articainic acid which is excreted by the kidney in the form of articainic acid glucuronide. The elimination half life of Articaine is 20 minutes and of articainic acid is 64 minutes. Equal analgesic efficacy and lower systemic toxicity allows Articaine use in a concentration higher than other amide local anesthetics.^(4,5) The total duration of anaesthesia recorded in our study was 3.1 hours for 2% Lignocaine and 4.5 hours for 4% Articaine which is statistically significant with p value of less than 0.05 showing longer duration of anaesthesia for 4% Articaine with 1:100000 epinephrine as compared to 2% Lignocaine with 1:100000 epinephrine. Costa et al⁽⁸⁾ also showed similar results with duration of pulpal anaesthesia of 39.2, 59.7 and 66.3 minutes respectively for 2% Lignocaine with 1:100000 epinephrine, 4% Articaine with 1:100000 epinephrine and 4% Articaine with 1:200000 epinephrine. Sierra-Rebolledo A. et al⁽⁹⁾ observed similar results with mean duration of anesthetic effect of 220.86 minutes for 4% Articaine and 168.20 minutes for 2% Lignocaine. The comparable results confirm statistically that 4% Articaine with 1:100000 epinephrine has longer duration of action as compared to 2% Lignocaine in pain intensity measured by visual Analogue scale.

Silva LCF et al⁽¹⁰⁾ also showed no significant reduction in post-operative pain between 4% Articaine and 2% Lignocaine after surgical extraction of third molars. Our findings were also similar to Malamed SF,⁽¹¹⁾ in which no significant difference between 4% Articaine and 2% Lignocaine in pain intensity measured by visual Analogue scale.

Conclusion

The researches based on pain are difficult to standardise as pain threshold varies amongst persons. From the above study we conclude that duration of anesthesia is longer with Articaine as compared to Lignocaine but there is no difference in the level of pain and time of onset of anesthesia.

References

- Peterson LJ, Ellis E, Hupp JR, Tucker MR. in Contemporary oral and maxillofacial surgery, 4th ed. St. Louis, Missouri; Mosby; 2003. Chapter 10, Postoperative Patient Management; P. 214-220.
- Collins M, Young I, Sweeney P, Fenn GC, Stratford ME, Wilson A, Harris M. the effect of Tramadol on dento-alveolar surgical pain: Br J Oral Maxillofac Surg. 1997;35:54-58.
- Malamed S F. Hand book of local anesthesia. 5th ed. St Louis, Mosby; 2004, P. 71-72.
- Moore PA, Boynes SG, Hersh EV, DeRossi SS, Sollecito TP, Goodson JM et al. The anesthetic efficacy of 4 percent articaine 1:200,000 epinephrine: two controlled clinical trials. J Am Dent Assoc. 2006 Nov;137(11):1572-81.
- Malamed SF, Gagnon S, Leblanc D. Articaine hydrochloride: a study of the safety of a new amide local anesthetic. J Am Dent Assoc. 2001 Feb;132(2):177-85.
- Alejandro Sierra Rebolledo, Esther Delgado Molina, Leonardo BeriniAytes, Cosme Gay Escoda. Comparative study of the anesthetic efficacy of 4% articaine versus 2% lidocaine in inferior alveolar nerve block during surgical extraction of impacted lower third molars Med Oral Patol Oral Cir Oral Bucal 2007;12:139-44.
- Martínez-Rodríguez N, Barona-Dorado C, Martín-Arés M, Cortés-Bretón-Brinkman J, Martínez-González JM. Evaluation of the anesthesia properties and tolerance of 1:100,000 articaine versus 1:100,000 lidocaine. A comparative study in surgery of the lower third molar. Med Oral Patol Oral Cir Bucal. 2012 Mar 1;17(2):e345-51.
- Costa CG, Tortamano IP, Rocha RG, Francischone CE. Onset and duration periods of Articaine and Lidocaine on maxillary infiltration. Quintessence Int. 2005 Mar;36(3):197-201.
- Alejandro Sierra Rebolledo, Esther Delgado Molina, Leonardo BeriniAytes, Cosme Gay Escoda. Comparative study of the anesthetic efficacy of 4% articaine versus 2% lidocaine in inferior alveolar nerve block during surgical extraction of impacted lower third molars Med Oral Patol Oral Cir Oral Bucal 2007;12:139-44.
- Silva LCF, Santos TSS, Santos JASS, Maia MC, Mendonça CG. Articaine versus lidocaine for third molar surgery: A randomized clinical study. Med Oral Patol Oral Cir Bucal 2012 Jan 1;17 (1):e140-5.
- Malamed SF, Gagnon S, Leblanc D. Efficacy of Articaine: a new amide local anesthetic. J Am Dent Assoc. 2000 May;131(5):635-42.