e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(8); 1314-1318

Original Research Article

A Comparison of Anesthetic Efficacy Between 4% Articaine with 1:1,00,000 Adrenaline and 2% Lidocaine with 1:1,00,000 Adrenaline for Extraction of Mandibular Posterior Teeth: A Randomized Controlled Trial

Anil Kumar Karanam

Assistant Professor, Department of Dentistry, Government Medical College, Nandyala, A.P

Received: 30-5-2023 / Revised: 30-06-2023 / Accepted: 30-07-2023
Corresponding author: Dr. Anil Kumar Karanam
Conflict of interest: Nil

Abstract:

Background of the study: Articaine is an amide local anesthetic that differs from other agents of its group due to the presence of thiophene ring instead of a benzene ring. Many studies claim that articaine is superior to lignocaine.

Objective: The present study has been designed to study the anesthetic efficacy of 4% Articaine with 1:1,00,000 Adrenaline in comparison with 2% Lidocaine with 1:1,00,000 Adrenaline administered to Nerve Block in 100 patients who needs extraction of mandibular posterior teeth.

Materials & Methods: This prospective, randomized single-blinded clinical trial included 100 patients needing extraction of either first or second molars. The onset of anesthetic action (both subjective & Objective), intraoperative anesthetic efficacy was measured using the modified Wong Baker Faces pain scale, total duration of anesthetic action and any re-anesthesia or additional anesthetic requirement was evaluated.

Results: The mean time of onset of anesthetic action - subjective symptoms for Articaine - 2.08 min (SD-0.11) and for Lignocaine - 4.05 min (SD-0.32) & for objective symptoms for Articiane is 2.87 min (SD-0.3) and for Lignocaine is 4.84 min (SD-0.29). The Intraoperative Anesthetic efficacy with Articaine group was 1.06 (SD-1.15) and with Lignocaine group was 1.36 (SD-1.24). The mean total duration of Anaesthesia for Articaine group was 209.55 min (SD-7.14) and for Lignocaine group was 173.92 min (SD-10.42).

Conclusion: 4% Articaine showed better pharmacological performance than 2% lignocaine, particularly the onset of anesthetic effect and duration of anesthetic action.

Keywords: Anesthesia, Articaine, Lignocaine.

Introduction

An important aspect of patient management in dentistry is pain control. [1] Dentistry enjoys the first credit of introducing general anaesthesia by Horace Wells in 1844. The era of local anaesthetics started with discovery of Cocaine in 1860. Later, the developments of Novocaine in 1904 and then Lignocaine by Lofgren and Lindquist in 1942 revolutionized dental practice. [3] Since 1948, Lignocaine hydrochloride has gained popularity as first amide local anesthetic drug used in dentistry. After more than a decade in clinical use and several research studies, Lignocaine has proven more effective, less allergenic and less toxic as compared with other local anesthetics. Therefore, it has become the “gold standard” local anesthetic. [3]

Articaine hydrochloride, comparatively a new anesthetic drug, was discovered in 1969. Since then, Articaine is the centre of heated discussions among dental surgeons as it has a faster onset and higher success rates than Ligncaine. [5] The advantages of Articaine is mainly attributed to its pharmacological characteristics. Substituting of the aromatic ring with a thiphenic ring increased the liposolubility of the drug along with its potency (1.5 times greater than that of Lignocaine). Moreover, Articaine is the only amide local anesthetic containing an ester group in its molecular structure – thus allowing metabolization of the drug both by plasma esterases ad by liver microsomal enzymes. The clinical advantages of Articaine include the duration of anesthetic effect – only surpassed by ultra-long acting anesthetics such as Bupivacaine, Etidocaine and Ropivacaine – and its superior diffusion through bony tissue. [3]

Although, numerous studies have confirmed that Articaine has superior efficacy as compared with that of Lignocaine, only few studies reported about the comparison of Lignocaine and Articaine in extraction of teeth, mainly mandibular posterior teeth. Hence, we decided to study the anesthetic efficacy of 4% Articaine wih 1:100000 Adrenaline with 2% Lignociane with 1:100000 Adrenaline

administered for Inferioir Alveolar Nerve Block for extraction of mandibular posterior teeth.

Thus, objectives of the study was to assess the efficacy of Articaine and Lignocaine for extraction of mandibular posterior teeth, to study the time and duration of onset of anesthesia in comparison with Lignocaine and study the Intraoperative anesthetic efficacy in comparison with Lignocaine.

Materials & Methods

The present study is a prospective, randomized, controlled clinical study which was conducted at Department of Dentistry, Government Medical College & Hospital, Nandyal, and Andhra Pradesh from June 2023 to August 2023. The protocol of this study was approved by the Institutional Ethics Committee, Government Medical College, Nandyal, and Andhra Pradesh.

100 patients aged between 18 years - 45 years with a clinical indication for extraction of either first or second mandibular molars was included in the study. All the patients were physically and mentally healthy, taking no medications, non-smoker and not an alcoholic. Patients with known or suspected allergies or sensitivities to any form or any ingredients of Local anesthetics were excluded from the study. Apart from allergies, systemic diseases, pregnancy, lactation, patients with Systolic Blood Pressure > 140 mm of Hg or < 90 mm of Hg & Diastolic Blood Pressure >90 mm of Hg or < 60 mm of Hg were excluded from the study. The 100 patients were randomly divided into two groups of 50 patients in each group and named it as Group A & Group B. Both the groups received Inferior Alveolar Nerve Block and Lingual Nerve block. The patients in Group A received 1.8ml of 2% Lignocaine with 1:80,000 Adrenaline (Lignospan, Septodont). The patients in group B received 1.8ml of 4% Articaine with 1:1,00,000 Adrenaline (Septanest, Septodont).

The following data were obtained in the study:

Onset of Anesthesia: Recorded from time of injection to onset of anesthesia measured subjectively. Objectively it is measured with a deep prick in the buccal and lingual mucosa in the immediate vicinity of the tooth to be extracted using a periodontal probe.

The Intraoperative anesthetic efficacy is evaluated subjectively using the Modified Wong Baker Faces Pain Scale immediately after the extraction.[8]

Duration of Anesthesia: The duration of anesthesia was in turn recorded as the time from initial patient perception of the anesthetic effect to the moment in which the effect began to fade.

Any signs of systemic toxicity like talkativeness, slurred speech, apprehension, localized muscular twitching and tremor of the hand and feet, rise in blood pressure, heart rate, respiratory rate were noted.

Results

Of the total 100 patients included in the study: 50 patients were administered 4% Articaine with 1:1,00,000 Adrenaline and other 50 patients were administered with 2% Lignocaine with 1:80,000 Adrenaline.

Of the 100 patients, 57 were males and 43 were females with a mean age of 37.2 ± 5.92).

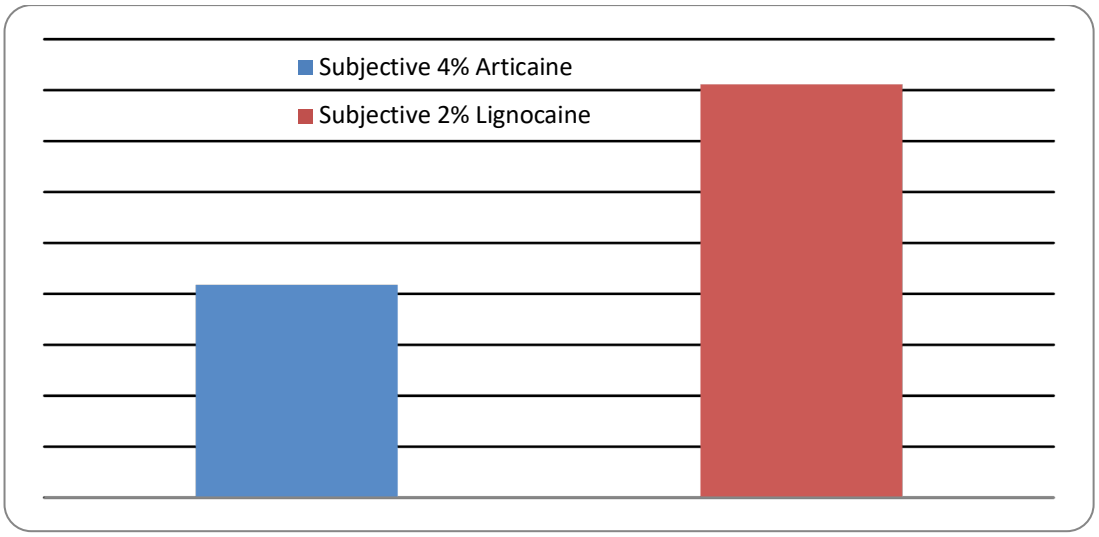

Figure 1: Subjective Onset of Anesthetic action

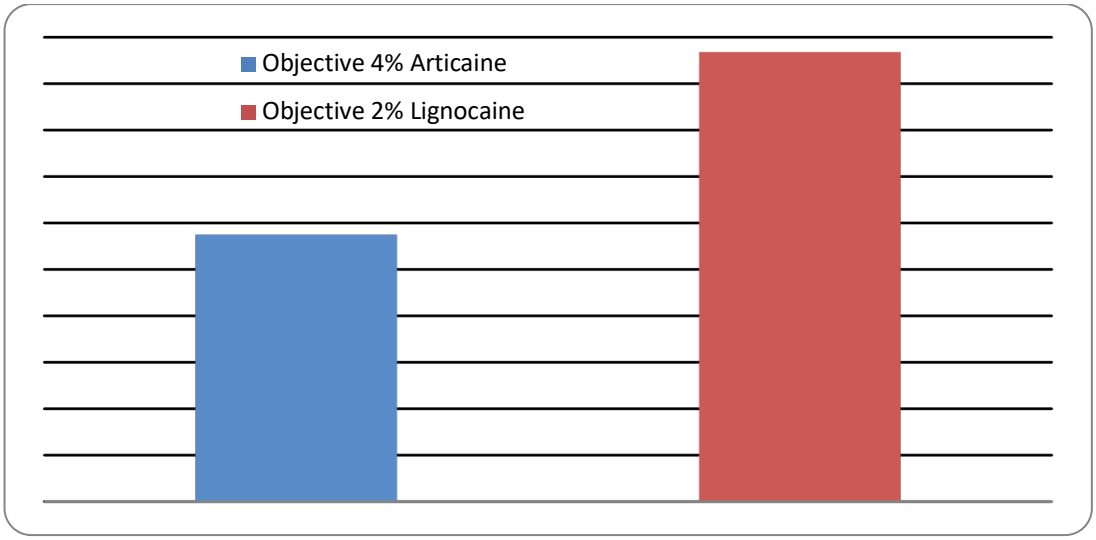

Figure 2: Objective Onset of Anesthetic Action

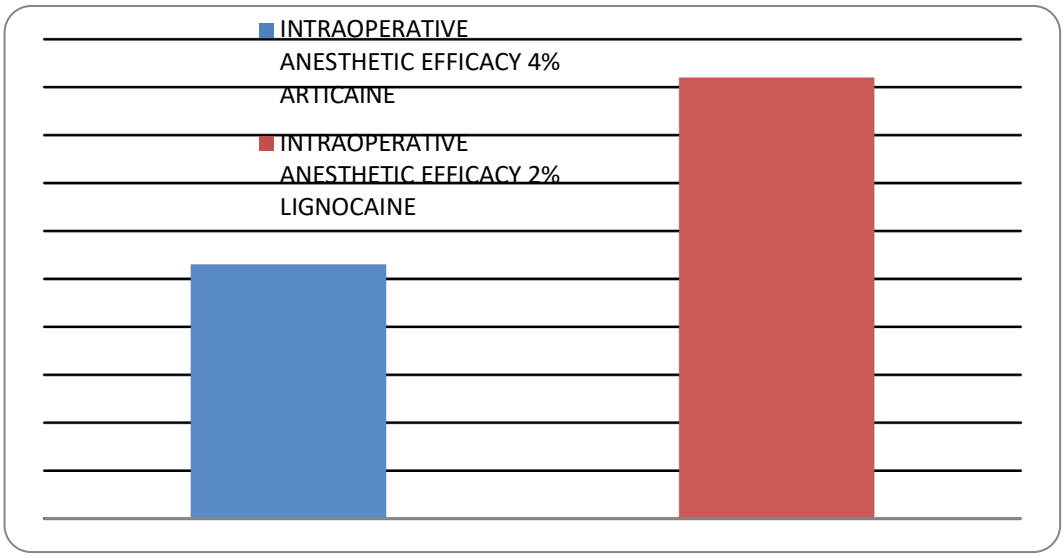

Figure 3: Intraoperative Anesthetic efficacy

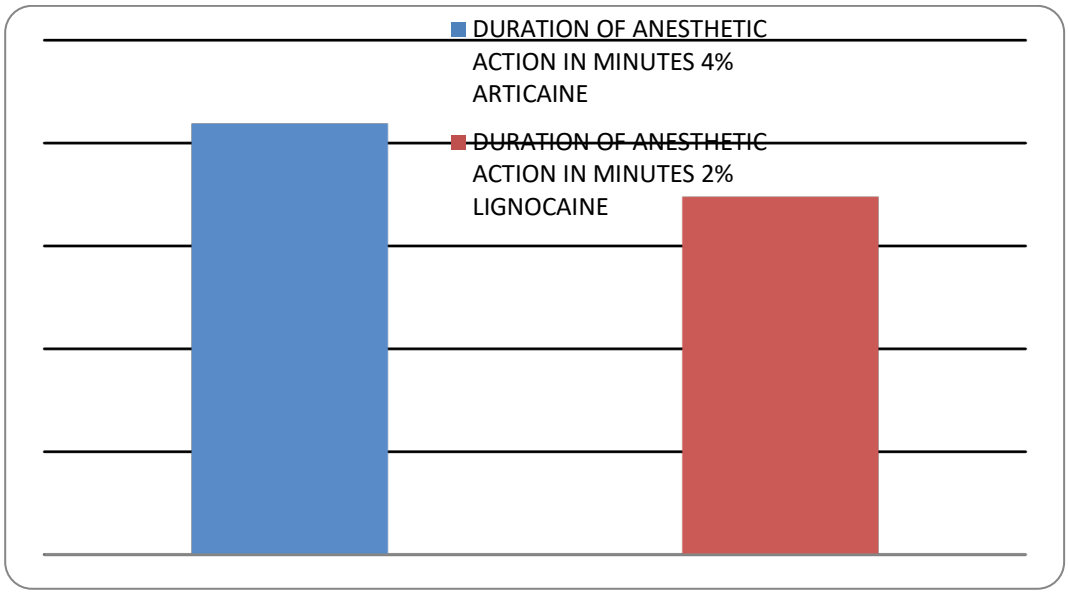

Figure 4: Duration of Anesthetic Action in minutes

The mean time of onset of anesthetic action - subjective symptoms for Articaine administered group B is 2.08±-0.11 min. and for Lignocaine administered group A is 4.05 ±0.32. min. The mean time of onset of anesthetic action - objective symptoms for Articiane administered group is 2.87 ±0.3 and for Lignocaine administered group is 4.84 ±0.29.

The Intraoperative Anesthetic efficacy was evaluated with the Modified Wong-Baker Faces Pain Scale. The mean value of value with Articaine group was 1.06 ±1.15 and with Lignocaine group was 1.36±1.24. The mean total duration of Anaesthesia for Articaine group was 209.55 ±7.14) and for Lignocaine group was 173.92 ±10.42. The mean total duration of procedure was 6.61 ±1.05). About 8 patients (16%) in Lignocaine group required additional anesthesia of Long Buccal Nerve block and 2 patients (4%) in Articaine group required long buccal nerve block. 4 patients (8%) in both groups required second injection of the Inferior alveolar nerve block.

Discussion

The present study compared the efficacy of 4% Articaine (with 1:1,00,000 adrenaline) with 2% Lignocaine (with 1:80,000 Adrenaline) in 100 patients who were indicated for extraction of mandibular posterior teeth via Inferior Alveolar Nerve block technique.

In our present study, the mean onset of anesthesia - subjective symptoms for Articaine administered group is 2.08 ±0.11 and for Lignocaine administered group is 4.05 ±0.32. The mean time of onset of anesthetic action - objective symptoms for Articiane administered group is 2.87 ±0.3 and for Lignocaine administered group is 4.84 ±0.29. Our study also demonstrated a rapid onset of anesthesia for articaine both subjectively and objectively. This is in contrast to the results achieved by Shruthi et al [4], who found slightly early onset period of 2.07 minutes for articaine and 2.18 for lignocaine and Deepashri H. Kambalimath et. Al.[3], who reported the average time of onset of anesthetic action subjective symtoms for Articaine was 1.35 ±0.49 and Lidocaine 1.40 ±0.60, the objective symptoms were at 2.12 ±0.81 for articaine and 2.15 ±0.86 for Lidocaine. In present study, the intraoperative anesthetic efficacy was measured using the modified Wong-Baker faces pain scale ranging from 0-10 (0-No pain & 10-worst pain), in which the patient was instructed to score intraoperative pain intensity. The mean value of value with Articaine group was 1.06 ±1.15 and with Lignocaine group was 1.36±1.24 with a slight advantage for articaine. These results correlated with the results reported by Deepashri H. Kambalimath et. Al.[3], Alejadro Sierra Rebolledo et. Al.[1] & Shruthi R et. Al. [4] The duration of the effect of an anesthetic is proportional to its protein binding. However, the duration of the effect of the local anesthetic is also dependent on the injection site or concentration of vasoconstrictor present in the anesthetic solution, among other factors. Articaine presents one of the greatest protein binding percentages of all amide local anesthetics, comparable only to ultra-log action substances such as bupivacaine, ropivacaine and ethidocaine. [1] In our study, the mean duration anesthetic effect of articaine was 209.55 ±7.14 and for lignocaine was 173.92±10.42. The present results correlated with the results reported by Nupoor Deshpande et. Al. [11] who reported that articaine achieved longer duration of anesthesia 202.17 ± 48.35 min than lidocaine (190.48 ± 38.43min).

Conclusion

The results obtained suggest that 4% articaine showed better pharmacological performance than 2% lignocaine, particularly the onset of anesthetic effect and duration of anesthetic action. However, no statistically significant difference in the intraoperative anesthetic efficacy was noted between articaine and lignocaine.

References

1. 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. Alejandro Sierra Rebolledo, Esther Delgado Molina, Leonardo Berini Aytés, Cosme Gay Escoda; Med Oral Patol Oral Cir Bucal 2007; 12:E139-44.
2. A Novel Decision-Making Process for Tooth Retention or ExtractionGustavo Avila, Pablo Galindo-Moreno, Stephen Soehren, Carl E. Misch, Thiago Morelli, and Hom-Lay Wang; J Periodontol; March 2009; Volume 80; Number 3.
3. Efficacy of 4% Articaine and 2 % Lidocaine: A clinical study Deepashri H. Kambalimath R. S. Dolas H. V. Kambalimath S. M. Agrawal; J. Maxillofac. Oral Surg. (Jan-Mar 2013) 12(1):3–10.
4. Articaine for Surgical Removal of Impacted Third Molar - A Comparison with Lignocaine Shruthi R, Kedarnath N S, Mamatha N S, Prashanth Rajaram, BhadraShetty Dinesh; Journal of International Oral Health. Jan-Feb 2013; 5(1):48-53.
5. Comparison of anesthetic efficacy of 4% articaine with 1:100,000 epinephrine and 2% lidocaine with 1:80,000 epinephrine for inferior alveolar nerve block in patients with irreversible pulpitis. Ravi Sood, Manoj-Kumar Hans, Shashit Shetty; J Clin Exp Dent. 2014;6(5):e520-3.

6. Comparison of speed of action and injection discomfort of 4% articaine and 2% mepivacaine for pulpal anesthesia of mandibular teeth: A randomized, double blind cross-over trial. Giath Gazal, Eur J Dent. 2015 Apr-Jun; 9(2): 201-206.
7. Anesthetic Efficacy of 4 % Articaine during Extraction of the Mandibular Posterior Teeth by Using Inferior Alveolar Nerve Block and Buccal Infiltration Techniques Khalid E. El-Kholey; J. Maxillofac. Oral Surg. Jan–Mar 2017; 16(1):90–95.
8. Pain measurement in oral and maxillofacial surgery Nattapong Sirintawat, Kamonpun Sawang, Teeranut Chaiyasamut, and Natthamet Wongsirichat, J Dent Anesth Pain Med. 2017;17(4):253-263.
9. 4% lidocaine versus 4% articaine for inferior alveolar nerve block in impacted lower third molar surgery Kiatanant Boonsiriseth, Sittipong Chaimanakarn, Prued Chewpreecha, Natee Nonpassopon, Manop Khanijou, Bushara Ping, Natthamet Wongsirichat J Dent Anesth Pain Med 2017;17(1):29-35.
10. Anesthetic Efficacy of Buccal Infiltration Articaine versus Lidocaine for Extraction of Primary Molar Teeth Nilesh V. Rathi, BDS, MDS, PhD, Anushree A. Khatri, BDS, Akshat G. Agrawal, BDS, Sudhindra Baliga M., BDS, MDS, PhD, Nilima R. Thosar, BDS, MDS, PhD, and Shravani G. Deolia, BDS, MDS Anesth Prog 66:3–7 2019.
11. Anesthetic efficacy and safety of 2% lidocaine hydrochloride with 1:100,000 adrenaline and 4% articaine hydrochloride with 1:100,000 adrenaline as a single buccal injection in the extraction of maxillary premolars for orthodontic purposes Nupoor Deshpande, Anendd Jadhav, Nitin Bhola, Manan Gupta J Dent Anesth Pain Med. 2020; 20(4):233-240.
12. Comparison of the Effects of Articaine and Lidocaine Anesthetics on Blood Pressure after Maxillary Infiltration Technique: A Triple-Blind Randomized Clinical Trial Amirhossein Moaddabi, Parisa Soltani, Maryam Zamanzadeh, Kamran Nosrati, Mojtaba Mollamirzaei, Mariangela Cernera, and Gianrico Spagnuolo International Journal of Dentistry Volume 2021, Article ID 8894160, 4 pages.
13. Anesthetic efficacy of single buccal infiltration of 4% articaine compared to routine inferior alveolar nerve block with 2% lidocaine during bilateral extraction of mandibular primary molars: a randomized controlled trial Zahra Bahrololoomi, Maedeh Rezaei J Dent Anesth Pain Med. 2021; 21(1):61-69.