



Research Article

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Comparative Evaluation of Local Anaesthetic Effect of 2% Lidocaine and 4% Articaine Administered using Inferior Alveolar Nerve Block Technique in Endodontic Therapy

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Abstract

Aim: To evaluation of local anesthetic effect of 2% lidocaine and 4% articaine administered using inferior alveolar nerve block technique in endodontic therapy

Material and Method: Forty patients were randomly allotted to Lidocaine and Articaine group. Twenty patients included in articaine group, anesthetized with 4% Articaine and twenty patients were anesthetized with 2% Lidocaine group. The pain experienced by patients during treatment was analyzed by using visual analogue scale (VAS).

Results: *In the present study Articaine group shows higher reduction in post operative VAS score (2.64 ± 0.64) as compared to preoperative VAS score (6.76 ± 0.55) this reduction in VAS score was found to be highly significant ($p < 0.001$) and Lidocaine group also shows reduction in postoperative (4.05 ± 0.51) VAS pain as compared to preoperative (6.89 ± 0.65) this reduction in VAS score was found to be significant ($p < 0.05$)*

Conclusion: *The observation from the study recommends the use of 4 % articaine with inferior alveolar nerve block as an alternative to 2 % lidocaine with inferior alveolar nerve block in endodontic therapy.*

Keywords: *Local anesthesia, Articaine, Lidocaine, Endodontic therapy*

Introduction

Pain is one of the most commonly experienced symptoms in dentistry and is a major concern to the dentist. Pain, in many instances, is considered as a caution signal. In practice of dentistry, pain is no more a warning signal, instead it is an evil to be conquered. One of the most important aspects of the practice of dentistry is the control or elimination of pain.¹

The most essential skill of all dental practitioners is the ability to provide safe and effective local anesthesia.² Fear and anxiety associated with endodontic treatment are reduced with effective pain management.³ A revolutionary advancement of the late 1800s was the discovery of local anesthetics that facilitated pain prevention without the loss of consciousness. Lidocaine hydrochloride is the most commonly used anesthetic agent since its clinical availability in 1948. It is labelled as “gold standard” due to its efficacy, low allergenicity, and minimal toxicity.⁴

Anesthesia for permanent mandibular teeth is usually obtained by inferior alveolar nerve block (IANB).⁵ It provides at least one hour of pulpal anesthesia in about 85% of the cases when local anesthetics with intermediate duration and equivalent potency associated with a vasoconstrictor are used. However, success of pulpal anesthesia is not guaranteed and may be compromised by many other factors.⁶ Clinical studies in endodontics have found failure with the IANB occurring between 44% and 81% of the time. The reasons for failure of local anesthetics including anatomic variations like cross innervations and accessory innervations, reduced local pH, tachyphylaxis of anesthetic solutions, and activation of nociceptors including tetrodotoxin and capsaicin-sensitive transient receptor potential vanilloid type 1. A number of other methods like infiltration anesthesia may be useful in overcoming collateral supply.⁷

Articaine is a local anesthetic solution, which was earlier synthesized by Rusching in 1969 as articaine.⁸ Molecular structure of articaine reveals an amide as well as an ester group. This combination allows its metabolism by both liver microsomal enzymes and plasma esterases. A thiophene ring present in place of aromatic ring in articaine increases lipid solubility of the solution as well as its potency (one and a half times greater than that of lignocaine).⁹ Malamed et al.¹⁰ proved 4% articaine as safe local anesthetic solution for both children and adults. Hence, the present study was done to compare the efficacy of 2% Lidocaine and 4% Articaine after IANB nerve block in permanent mandibular first molars requiring endodontic treatment.

Material and Methods

This in vivo prospective study was conducted after obtaining ethical approval from scientific committee and consent from patient.

Inclusion criteria

- Patient aged between 15-50 years
- Patient requiring endodontic treatment in permanent mandibular first molar
- Patients with good systemic health.
- Patients who were willing to participate in the study by understanding the pain scale.

Exclusion criteria

- Patients who had taken pain modifiers within last twelve hours
- Allergies to local anaesthetics or sulphites.
- History of significant medical conditions.
- Pregnant and lactating women.
- Patients with intraoral lesions at the injection site

In this study 40 healthy male and female patient satisfying inclusion and exclusion criteria were selected. Intra oral periapical radiograph of the tooth to be treated was made to rule out any periapical pathology.

Material

4% articaine (Septanest 1:100,000, 1.7 mL, Septodont, France)

2% lignocaine (Lignospan special 1:80,000, 1.8 mL, Septodont, France)

After selection of subjects, they were randomly divided into groups.

Group A - Lidocaine group

Group B - Articaine group

Patient was seated comfortably on the dental chair. In group A 1.8 ml of 2 % lignocaine solution was administered using inferior alveolar nerve block technique. In group B 1.8 ml of 4 % articaine solution was administered using inferior alveolar nerve block technique.

After evaluating the subjective symptoms of profound anesthesia, isolation was done using rubber dam and access cavity was prepared with high-speed air rotor hand piece using #4 round carbide bur, and Endo Z bur. After the “drop in” into the pulp chamber was obtained, the bur was moved laterally and occlusally, finishing of access cavities was done with Endo Z carbide fissure burs to finish and slope the walls of the access cavity. The pulp chamber was irrigated with 3% sodium hypochlorite (NaOCl) followed by saline and root canal orifices were explored with endodontic explorer (DG-16, Dentsply/Maillefer, Switzerland). Patients were instructed to lift their hand if any pain was obtained throughout the procedure.

Assessment of Anesthetic efficacy

Onset of Anesthesia: It was assessed from the time lapse between the end of the nerve block and onset of symptoms of subjective anesthesia (feeling of heaviness at the site of injection). A standard digital stop clock was used. It was calculated in seconds.

Pain Assessment: The pain on injection was rated by VAS. Patients were showed the scale and were asked to mark the pain rating. The corresponding pain score on the numerical scale was recorded. The VAS included a 10 cm straight horizontal line numbered at each centimetre with following criteria; 0-1- no pain; 2-3- mild pain; 4-6- moderate pain; 7-10-severe pain. The data were entered over a spreadsheet, and statistical analysis was performed using SPSS software version 17 (IBM, Chicago, United States).

Results

Onset of Anesthesia: Mean onset value of group A was 175 ± 5.05 seconds and that for group B was 167 ± 4.75 seconds. There was no significant difference between the groups. ($p > 0.05$). (Table no. 1) In the present study Articaine group shows higher reduction in post operative VAS score (2.64 ± 0.64) as compared to preoperative VAS score (6.76 ± 0.55) this reduction in VAS score was found to be highly significant ($p < 0.001$) and Lidocaine group also shows reduction in postoperative (4.05 ± 0.51) VAS pain as compared to preoperative (6.89 ± 0.65) this reduction in VAS score was found to be significant ($p < 0.05$)

Group	Mean time of onset	P Value
Group A – Lidocaine group	175 ± 5.05	$(p > 0.05)$
Group B – Articaine group	167 ± 4.75	

Time interval	Mean VAS score	P value
Group A – Lidocaine group	Pre operative 6.89 ± 0.65	< 0.05
	Post operative 4.05 ± 0.51	
Group B – Articaine group	Pre operative 6.76 ± 0.55	< 0.001
	Post operative 2.64 ± 0.64	

Discussion

Purpose of the present study was to evaluation of local anesthetic effect of 2% lidocaine and 4% articaine administered using inferior alveolar nerve block technique in endodontic therapy.

Pain control during any operative or surgical procedure is one of the most important factors which determines the success of a treatment. There are various methods used to control pain among which use of local anaesthetic agents is the most commonly employed technique in dental practice.¹¹ Local Anaesthetics (LA) are those agents which upon topical application or local administration cause reversible loss of sensory perception, especially of pain, in a circumscribed region of the body. (12)

Inferior alveolar nerve block is the most frequent technique used with mandibular molars to achieve local anesthesia. However, it does not always result in successful pulpal anesthesia. Uncontrolled techniques or local anatomical variations are considered the main cause of IANB failure.¹³ Lidocaine is the most local anesthetic used in dentistry. High efficacy, minimal allergy and safety of this drug made it the gold standard agent for IANB. Despite lidocaine being the benchmark, numerous reports have advocated the use of articaine hydrochloride as a superior anaesthetic agent, primarily based on its enhanced anaesthetic potency, which is 150 % higher than that of lidocaine, along with other advantages. (14)

In present study it was found that both articaine and lidocaine were effective in reduction in pain perception but articaine has a better efficacy in terms of pain reduction.

Conclusion

The observation from the study recommends the use of 4 % articaine with inferior alveolar nerve block as an alternative to 2 % lidocaine with inferior alveolar nerve block in endodontic therapy.

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