

Original Research

A comparative analysis of 4% articaine and 2% lignocaine in evaluating the efficacy during pulpectomy procedures in pediatric patients

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ABSTRACT

Aim: A comparative analysis of 4% articaine and 2% lignocaine in pulpectomy procedure. **Materials & methods:** A total of 30 subjects were enrolled. The children in the age group of 4-6 years were included. Pulpectomy in both mandibular second molar of primary teeth was done and were randomly divided into two groups. The chi-squared test was done. The results were analysed using SPSS software. **Results:** Based on SEM scale, in the articaine group, 6 (20%) patients reported pain during dental procedure, and 24 (80%) no pain, while in the lidocaine group, 5 (16.7%) patients reported pain and 25 (83.4%) no pain. **Conclusion:** 4% articaine had a comparable anesthetic outcome to that of 2% lidocaine in pulpectomy.

Keywords: Articaine, Lidocaine, Pulpectomy.

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INTRODUCTION

Pain control in dentistry is an important part in reducing the fear and anxiety associated with dental procedures especially in children. Local anaesthetics form the backbone of pain control in dentistry and there has been a substantial research for a safe and effective anaesthetic agent for a few decades for endodontic procedures.¹ Two percent lignocaine is the gold standard and considered the most efficacious anaesthetic agent for use in pediatric and adult patients and has been widely used for inferior alveolar nerve blocks.² Clinical studies have shown the failure of IAN blocks to be approximately 44-84% and 0-36% in maxillary infiltrations which necessitated the need for supplemental injections in the form of

intrapulpal, buccal infiltrations etc.^{3,4} Articaine entered into the clinical practice in 1976 and has been widely used since then due to its enhanced efficacy and safety. Along with the ester group, articaine consists of thiophene ring instead of benzene ring which makes it different from other anaesthetic solutions. The increased diffusion of the articaine solution is attributed to the presence of thiophene ring, which increases the lipid solubility thereby allowing the solution to cross the lipid membrane.⁵ Clinical studies on articaine and lignocaine have focused on the time to onset of clinical anesthesia, dose, duration, depth of anesthesia along with the safety and efficacy profile, and mean time of onset in children versus adults, infiltrations and nerve blocks,

conventional syringe versus computer-controlled drug delivery system Single Tooth Anesthesia-Wand (STA-Wand) administered for restorative procedures and extractions.^{6,7}The available literature on articaine confirms the effectiveness of conventional single buccal infiltrations in maxillary primary molar extractions replacing the need of painful palatal injections which is usually required whenever conventional infiltration anesthesia with lignocaine is preferred.⁸Interestingly, the literature available on the efficacy of articaine intraligamentary injections administered with Wand for pulpectomy procedures on primary molar teeth seems to be limited, and sometimes, the intraligamentary injections have also been considered to overcome the drawbacks of nerve block particularly when there is a need for treatment procedures in bilateral quadrants at the same appointment.^{9,10} Hence, this study was conducted to compare and analyse 4% articaine and 2% lignocaine in pulpectomy procedure.

MATERIALS & METHODS

A total of 30 subjects were enrolled. The children in the age group of 4-6 years were included. Pulpectomy in both mandibular second molar of primary teeth was done and were randomly divided into two groups. Average pain rate in SEM (sound, eye, and motor) was noted. In the first meeting, infiltration with articaine 4% (epinephrine 1/100 000) was performed for all patients in group 1 on the left side of the mandible. At the next appointment, inferior alveolar nerve block was done with lidocaine 2% on the right side of the mandible (epinephrine 1/80 000). Notably, for all patients in the second group, the first injection was performed on the right second primary molar with articaine 4% (epinephrine 1/100 000), and inferior alveolar nerve block was also done with lidocaine 2% on the left side of the mandible (epinephrine 1/80 000).The chi-squared test was done. The results were analysed using SPSS software.

RESULTS

Based on SEM scale, in the articaine group, 6 (20%) patients reported pain during dental procedure, and 24 (80%) no pain, while in the lidocaine group, 5 (16.7%) patients reported pain and 25 (83.4%) no pain. There was no statistically significant difference between these two groups. According to VAS scale, in the articaine group, 12 (40%) patients reported pain and 18 (60%) no pain, while in the lidocaine group, 16 (53.4%) patients reported pain and 14 (46.7%) no pain.

Table 1: The number of cases with or without experience of pain according to SEM scale

| | Number of subjects | |
|-----------|--------------------|--------------|
| | Pain | Without pain |
| Lidocaine | 5 | 25 |
| Articaine | 6 | 24 |

Table 2: The number of cases with or without experience of pain according to VAS scale

| VAS scale | Number of cases | |
|-----------|-----------------|--------------|
| | Pain | Without pain |
| Lidocaine | 16 | 14 |
| Articaine | 12 | 18 |

DISCUSSION

Pain control is mandatory to reduce anxiety during dental treatments, particularly in children.¹ IANB is the preferred technique for achieving pulpal anesthesia during treatment of mandibular primary molars.¹¹ Clinical studies have reported the failure of IANB as high as 44-84%, necessitating supplementary injections.^{3,4} Two percent lidocaine, the most commonly used anesthetic agent in dentistry, generally in the IANB technique.¹ Buccal infiltration (BI) using 2% lidocaine is not as effective as the IANB for achieving profound anesthesia in mandibular molars, due to the low penetration of anesthetic solutions through the buccal cortical plate.^{12,13} The prolonged soft tissue anesthesia frequently associated with IANB could result in self-inflicted trauma such as biting of lip/cheek.¹ Hence, this study was conducted to compare and analyse 4% articaine and 2% lignocaine in pulpectomy procedure.

In the present study, based on SEM scale, in the articaine group, 6 (20%) patients reported pain during dental procedure, and 24 (80%) no pain, while in the lidocaine group, 5 (16.7%) patients reported pain and 25 (83.4%) no pain. There was no statistically significant difference between these two groups. A study by Arali V et al, the onset of anaesthesia with 4% articaine was faster as compared to 2% lignocaine. The duration of anaesthesia with articaine infiltration was shorter. The need for supplemental injection in the articaine group was less. Four percent articaine infiltration can be used in children with irreversible pulpitis. It can be used to replace the IAN block in children thereby reducing the post anaesthetic complications like lip biting.¹⁴

In the present study, according to VAS scale, in the articaine group, 12 (40%) patients reported pain and 18 (60%) no pain, while in the lidocaine group, 16 (53.4%) patients reported pain and 14 (46.7%) no pain. Another study by Erfanparast L et al, Of the 38 patients included in the current study, 10 (26.3%) subjects in the lidocaine group and nine (23.6%) in the articaine group complained of pain during their dental treatment procedures, but this difference was not statistically significant. According to the findings of this study, buccal infiltration of 4% articaine had a comparable anesthetic outcome to that of 2% lidocaine for inferior alveolar nerve block in pulp treatment of the second primary mandibular molars.¹⁵ The study by Berlin et al.¹⁶ reported that “mean onset times of pulpal anesthesia with 4% articaine is 1.3 min and with 2% lignocaine is 2.2 min when delivered as an intraligamentary injection using a computer-controlled local anesthetic delivery system.”

In contrary, Ram and Amir¹⁷ reported no difference in the onset time between 4% articaine and 2% lignocaine. Furthermore, it has been proven that mean onset time of anesthesia with 4% articaine was generally shorter for children than adults.¹⁸ Many previous studies have concluded that 4% articaine can be successfully used in children of 4 to 10 y of age. Lemay et al and Dudkeiwich et al.,^{19,20} found the mean time of onset of anaesthesia to be shorter in children than adults. This could be attributed to the cancellous nature of the paediatric maxilla and mandible. Articaine's excellent pediatric safety and efficacy profile supported by other studies in the literature.²¹ Clinical trials comparing the time of onset of clinical anaesthesia and the duration and depth of anaesthesia have shown that 4% articaine provides significantly shorter time of anaesthesia as well as greater consistency than 2% articaine.^{22,23} Toxicity of 4% articaine as compared to lowered concentrations was found to be non-significant.²²

Root canal filling material of primary teeth should be resorbed at an identical rate, or as similarly as possible, to that of physiological root resorption. This study used a modified paste comprising a mixture of ZOE, iodoform, and calcium hydroxide as root canal filling material in primary molars. Our results indicated that the modified paste with a success rate of 92.5% is a much better material compared with Vitapex and had better absorbability compared with ZOE alone. The possible reason was that the mixture does not set into a hard mass. The potential mechanism lied in two aspects. Firstly, the essence of formation of ZOE is the reaction of eugenol and bivalent zinc ions to form insoluble chelation, wrapping remanent zinc oxide in it and forming a solid mass. Because calcium ion dissolves more easily than zinc ions, adding calcium hydroxide forms divalent metal chelate salt containing mainly eugenol calcium. Owing to the high solubility of calcium hydroxide, the reaction time is shorter, but strength of chelation was slightly low, thus degrade more quickly. Secondly, iodoform dissolves easily upon contact with solutions and tissue fluid, changing the structure of the filling mass to a porous and loose state that might be resorbed more easily.²⁴

CONCLUSION

Buccal infiltration of 4% articaine had a comparable anesthetic outcome to that of 2% lidocaine in pulpotomy.

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