



Comparison of effectiveness of infiltration articaine and block of lidocaine on pulp therapy of primary mandibular second molar in children aged 8-10 years

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ABSTRACT

Background and Objectives: Proper anesthesia and pain management during treatment are of the most important concerns in dentistry for people of all ages, especially children. This study compared the success rate of lidocaine block with articaine buccal infiltration during anesthesia of the primary mandibular second molars in children aged 8-10 years.

Materials and Methods: The present clinical trial was conducted on 20 children aged 8-10 who referred to the Department of Pediatrics of the Faculty of Dentistry at Shahid Sadoughi University of Medical Sciences in Yazd (Iran) and needed to be treated with pulpotomy on both primary mandibular second molars. The patients were randomly divided into two groups. At the first session, a group received articaine buccal infiltration and the other group experienced inferior alveolar nerve block. At the next visit, this trend was reversed. Pain during pulpotomy and all vital signs were measured before and after each injection. For data analysis, by SPSS17 software using the Mann-Whitney and Wilcoxon tests were used.

Results: According to the results, the pain during pulpotomy was significantly lower in the articaine group (P-value>0/001). Pulse and breathing changes were statistically significant before and after both injections (P-Value>0/001).

Conclusion: The articaine buccal infiltration can be employed for the pulpotomy treatment in the primary mandibular second molars in children aged 8-10 years.

Keywords: Articaine, Lidocaine, Pulpotomy, Local anesthesia.

Introduction

The pain management is the most significant aspect of child behavioral guidance. Therefore, it is essential to minimize the pain and discomfort levels at each visit and control the painful condition [1]. Local anesthesia is one of the strategies for the pain manage-

ment. In fact, the injection is a part of the dental treatment that generates the most negative responses in children. The behavior of young children can be worse with the painful mandibular nerve block. Avoiding the nerve block in children destroys the risk of lingual and inferior alveolar

nerve injuries [2]. In fact, the pulpotomy treatment is the most widely used for pulp-exposed primary teeth due to caries [3]. The pain during pulpotomy is a common problem during treatment, especially in cases of irreversible pulpitis. For years, the lidocaine has been considered a gold standard in dentistry for the analgesic agents. Currently, the articaine is widely applied compared to the lidocaine; the articaine is 1.5 times more potent and only 0.6 times more toxic [2]. The articaine infiltration is suitable for the posterior mandibular analgesia [4]. Therefore, the need for a lower alveolar nerve block is reduced in children [2]. Articaine is an amide-type local anesthetic and its action is similar to other amide-type anesthetic, but its unique chemical structure offers more benefits than other amide-type anesthesia [2]. Most studies have been conducted on the use of articaine in adults, and few studies have been conducted on the efficacy and safety of articaine in children [4]. In addition, some studies show conflicting results. The aim of this study was to Comparison of effectiveness of infiltration articaine and block of lidocaine in controlling pain during on pulp therapy of primary mandibular second molar in children aged 8-10 years.

Materials and Methods

This study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences (ethics code of 1394.92) and recorded on the Iranian Registry of Clinical Trials (IRCT 2015061517935N4). The informed consent was obtained from the parents. The current research was conducted on 20 patients aged 8-10 years who needed to receive the pulpotomy treatment of the bilateral mandibular primary secondary molars, and admitted to the Department of Pediatrics of the Faculty of Dentistry. A periapical radiograph of the target tooth was taken from each child. Inclusion criteria were no spontaneous pain, no history of systemic kidney, liver and digestive system diseases, no history of long-term bleeding and platelet disease, no hypersensitivity to the used drugs. The children had no learning disabilities and they understood the Persian language well. Exclusion criteria included child anxiety during operation, poor cooperation, and analgesic use at the baseline, spontaneous pain and symptoms of dental necrosis. The patients were injected accidentally to the left or right side. At random, the articaine or the lidocaine was injected into the primary second molars at the first or second visit. Before injection of anesthesia and 5 minutes after injection, the patient's blood pressure and pulse were measured by a digital

barometric device (ZYKLUS med) and the number of breathing and saturation O₂ by pulse oxymeter (Oxiant 315) were measured by one of the researchers in both groups.

The dentist was aware of the types of anesthetic but the child and the parents did not know. The study was performed as Single Blind Parallel trial. Only two primary mandibular second molars were treated for each child. The patients in the Group 1 received 2% lidocaine with epinephrine 1:100,000 (Darby Dental Supply, LLC). The Group 2 was injected by 4% articaine with epinephrine 1:100,000 (Septodont, France). First, the mucus was dry and the local anesthesia was used to reduce the discomfort associated with the insertion of the needle into the mucous membrane. Benzocaine gel 20% (Benzotop 200mg/g, DFL Industria e Comerico S.A.) was used for this purpose. Then the anesthetic injection was done randomly as the articaine infiltration or the lidocaine block. All vital signs were measured and recorded again 5 minutes after the injection of anesthesia. A pediatrician started the pulpotomy treatment 15 minutes after the lidocaine block and 10 minutes after the articaine infiltration [5]. The pulpotomy can be used in the primary teeth when coronal pulp and intracanal tissues are alive. After the completion of the pulpotomy treatment, the pediatrician recorded the pain during treatment by five-face visual analogue scale [6]. The teeth were then restored with amalgam or covered with stainless steel coating with appropriate size. The pain was assessed through a five-point rating scale, which had good validation. Five cartoon faces with different face modes were shown to the child. The scores included (0) no pain; (1) mild pain; (2) moderate pain; (3) severe pain; (4) very severe pain (Figure 1).

Twenty-four hours after the treatment, the patient was personally present to be examined for possible chewing of lips and cheeks. Finally, the data were analyzed by SPSS17 software using Wilcoxon and Mann-Whitney test for checking the VAS forms and Chi-square test for assessing the frequency of complications.

Results

The assessments were carried out for all 20 children aged 8-10 years who met the inclusion criteria. According to Table 1 and P-value<0/001 of the Mann-Whitney test, the mean VAS score was significantly different between the two groups. The mean of systolic blood pressure before and after intervention (P-value=0.46)

and mean diastolic blood pressure before and after intervention (P-value=0.307) and mean saturation blood oxygen before and after intervention (P-value=0.967) between Two groups were not significant. The mean pulse before and after intervention (P-value<0.001), the mean breathing before and after intervention (P-value=0.003) were significant between the two groups. In accordance with Table 2 and Wilcoxon rating test, only the mean pulse and breathing before and

after lidocaine intervention have a significant difference. According to the Wilcoxon rating test, the mean pulse and before and after breathing the articaine intervention have a significant difference (Table 3).

Side effects including biting lips and cheeks were followed up with any anesthetic within the first 24 hours after treatment, with no side effects reported in the lidocaine group, but in the articaine group there

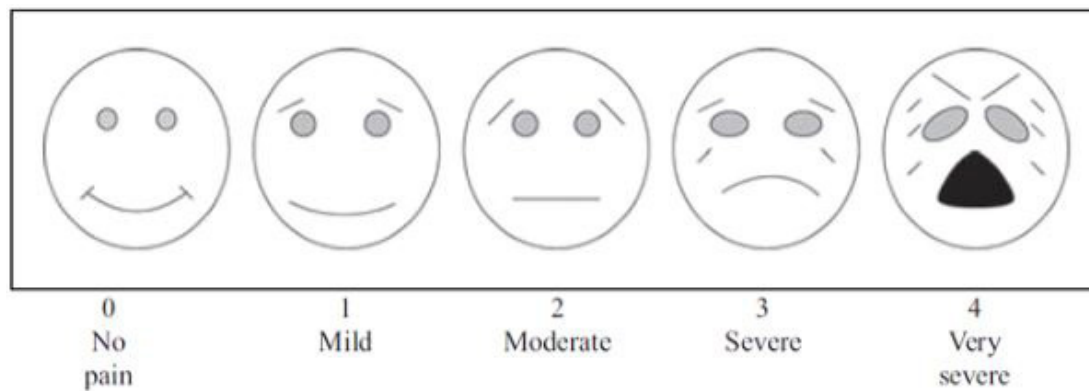


Fig 1. Five-point rating scale of pain.

Variables	Mean \pm standard deviation	Median
Lidocaine	2.3 \pm 1.26	2.5
Articaine	0.4 \pm 0.75	0
P-value	>0.001	

Table 1. Determination and comparison of mean and median VAS score.

Variables	Systolic Blood Pressure	Diastolic Blood Pressure	Pulse	Breathing	Saturation Blood Oxygen
Before	110.25 \pm 10.33 MD=108.5	74.1 \pm 12.61 MD=73	99.45 \pm 7.94 MD=98	18.95 \pm 2.54 MD=20	97.95 \pm 2.89 MD=99
After	108.35 \pm 11.19 MD=110.5	74.1 \pm 13.32 MD=72.5	107.15 \pm 10.23 MD=105	20.4 \pm 1.95 MD=21	98 \pm 2.07 MD=98
P-value	0.46	0.307	>0.001	0.003	0.967

Table 2. Comparison of the mean of the variables studied before and after the intervention in the Lidocaine group.

Variables	Systolic Blood Pressure	Diastolic Blood Pressure	Pulse	Breathing	Saturation Blood Oxygen
Before	108.9 \pm 8.69 MD=108	73.2 \pm 12.13 MD=71	99.15 \pm 10.65 MD=99	18.3 \pm 2.55 MD=19	97.95 \pm 3.3 MD=99
After	107.5 \pm 9.06 MD=108	71.85 \pm 10.13 MD=71.5	100.15 \pm 10.09 MD=98	19.8 \pm 2.09 MD=20.5	98.3 \pm 2.12 MD=99
P-value	0.886	0.55	0.05	0.001	0.381

Table 3. Comparison of the mean of the variables studied before and after the intervention in the Articaine group.

Discussion

Pulp treatment is a common and painful treatment in children. The results of this study showed that the articaine infiltration in children aged 8-10 years reduced the pain during pulpotomy treatment of the primary mandibular second molars. The use of the self-reported VAS (Visual Analogue Scale) provides information that is more reliable though its accuracy is dependent on how to raise the questions and on the proper use of the scale [7]. Several visual scales are available but the five-face visual analogue scale is the simplest tool for measuring successfully the effect of anesthetics in young children. The 5-faces pain scale was used in this study to measure the pain. In this study, immediately after injection, the pulse rate of patients was significantly higher than before the injection, which is related to anxiety in patients. The higher pulse and blood pressure changes in the lidocaine group may be due to more painful block injections than the infiltrator, which increases the anxiety of the patients. The current study confirms the results of Kandasamy et al. and Malamed et al. who evaluated the pain during the dental restoration and complex operations. However, this study examined the effect of the articaine during the pulpotomy treatment. Kandasamy et al. [8] examined the articaine effect on extraction of maxillary teeth with lidocaine in children. Malamed et al. [5] also compared the effect of articaine with lidocaine during the restorative treatment and the pulpotomy treatment in children. In the lidocaine group, no side effects were reported but in the articaine group there was an occasional biting incident. This is consistent with the study of Malamed, in which a case of lip biting associated with articaine was reported in one patient. In the study of Donald chi [9], there was a case of lip biting following block of lidocaine. In the Hass study [10], articaine is more likely to parasthesia and it is said that lidocaine 2% is best for children so in this study, both anesthetics were used by block injections. Leith et al. [2] also suggested that the lidocaine could be replaced with the articaine buccal infiltration and also the anesthetic acquisition with articaine is recommended in the patient with MIH (Molar Incisor Hypomineralisation). They also stated that when we use articaine buccal infiltration in adults, the anesthetic substance would release in the palate as well. This may not be useful in treating traumatic injuries in children who need the injection in the palate, indicating a very good bone infiltration of the articaine. In the present study, the investigations were performed in the mandible, and the articaine operated more effective in relieving the pain, suggesting high bone infiltration.

Ram et al. [11] compared the efficacy of the articaine and the lidocaine in children to evaluate the time of the onset, duration of numbness of the soft tissues, children's sensation after treatment and the occurrence of adverse events. According to their results, duration of numbness of the soft tissues with articaine was significantly longer lasting than with lidocaine. This may be due to the fact that the parents recorded a time when the soft tissue anesthesia was lost; and in their study, sensation to the pain after treatment and the occurrence of adverse events were similar in both cases. In a study of Aggarwal et al., the success rate of the inferior alveolar nerve block was reduced in patients with irreversible pulpitis and 30 out of 84 patients needed supplemental buccal and lingual infiltrations of articaine and lidocaine. As well, the success rate of the articaine infiltration was significantly higher than in the lidocaine infiltration [12]. Wright et al. evaluated the effectiveness of infiltration anesthesia in the mandibular primary molar region, as 65% had little or no pain during dental treatment as well as no difference was observed between the used anesthetics [13]. In the present study, the articaine has been more successful; the differences between the results of the study by Wright and our research may be due to the fact that Wright et al. examined only restorative treatment for the mandibular primary molars, as well as they used the SEM Scale and Frankel Scale to examine the pain while we applied the self-report VAS that is a more valid measure.

In study of Kanaa et al. [14] articaine infiltration was significantly more effective than 2% lidocaine. This study confirms the results reported by Kanaa et al., with the difference that this study examined the effects of anesthesia in the pulpotomy treatment of the permanent teeth. Moreover, Kanaa et al. used the pulp tester to determine the anesthetic depth, which seems to be a more accurate method than the self-report of pain method in this study. However, this test has inadequate reliability in children. If further studies can confirm the results of this study on the efficacy of this anesthetic, it would minimize the use of the painful mandibular nerve block and the painful and unpleasant complementary injections for children, such as intrapulpal and periodontal ligament injections, which might be prescribed because of the failure of the nerve block [9].

Conclusion

This study suggests the use of local anesthetics with articaine in children aged 8-10 years as an effective approach to achieve deeper numbness during the pulpo-

tomy treatment of primary mandibular second molar. However, the dentist should be careful about the overdose of this anesthetic.

Conflict of Interest

There is no conflict of interest to declare.

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