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ORIGINAL RESEARCH

Comparison of Visual Analog Scale Scores in Pain Assessment during Pulpotomy using Different Injection Materials in Children Aged 6 to 8 and 8 to 10 Years

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ABSTRACT

Aim: Proper anesthesia and pain management during treatment are 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 6 to 8 and 8 to 10 years.

Materials and methods: The present clinical trial was conducted on 40 children aged 6 to 8 and 8 to 10 years who were referred to the Department of Pediatrics of the Faculty of Dentistry at Shahid Sadoughi University of Medical Sciences in Yazd (Islamic Republic of 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 (IAN) block. At the next visit, this trend was reversed. Visual analog scale (VAS) was used to evaluate the pain during pulpotomy.

Results: Data were analyzed by Statistical Package for the Social Sciences (version 17) software using Mann–Whitney test. According to the results of this test, the pain during pulpotomy was significantly lower in the articaine group ($p < 0.001$).

Conclusion: Articaine buccal infiltration can be employed for pulpotomy treatment in primary mandibular second molars.

Clinical significance: This research will eliminate block injection of lidocaine in children and utilize infiltration of articaine for pulpotomy treatment of mandibular teeth, hence preventing lingual nerve damage and prolonging paresthesia of IAN, lip, and cheek bite due to IAN block anesthesia.

Keywords: Articaine, Infiltration, Lidocaine, Pulpotomy.

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INTRODUCTION

Pain management is an important part of dentistry, especially in pediatric dentistry.[1] The pain seems to be one of the leading causes of discomfort and stress in children. In the past decade, further attention has been paid to the pain management.[2,3] The pain management is the most significant aspect of a child's behavioral guidance. Therefore, it is essential to minimize the pain and discomfort levels at each visit and control the painful condition.[4] Local anesthesia is one of the strategies for the pain management. In fact, the injection is a part of the dental treatment that generates the most negative responses in children. These responses will be more or less negative if accompanied by four or five successive injections. In addition, dental follow-up visits make children more prone to injection-induced stress.[5] The behavior of young children can be worse with the painful mandibular nerve block. It is well known that the articaine has a high penetration potential into the bone and could be more successful in local infiltrations and might be replaced by the mandibular nerve block in the treatment of the primary molars.[6]

Avoiding the nerve block in children has many benefits: The pain control during pulpotomy and tooth extraction can be achieved with articaine infiltration alone, and also avoiding the nerve block in children destroys the risk of lingual and IAN injuries.[7]

In fact, the pulpotomy treatment is the most widely used therapy for pulp-exposed primary teeth due to caries.[8] 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 as the analgesic agent. Currently, articaine is widely applied compared with lidocaine; the articaine is 1.5 times more potent and only 0.6 times more toxic.[7] The articaine infiltration is suitable for the posterior mandibular analgesia.[9] Therefore, the need for a lower alveolar nerve block is reduced in children.[7] The difference in the metabolism of articaine causes it to have a half-life of 30 minutes, while lidocaine has a half-life of 90 minutes.[4]

MATERIALS AND METHODS

This study was approved by the ethics committee of Shahid Sadoughi University of Medical Sciences (ethics code 1394.92) and recorded on the Iranian Registry of Clinical Trials. An informed consent was obtained from the parents. The current research was conducted on 20 patients aged 6 to 8 years and 20 patients aged 8 to 10 years who needed to receive the pulpotomy treatment of the primary–secondary molars and were 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; and 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; thus, the patients in each age group were divided into two groups. At random, articaine or lidocaine was injected into the primary mandibular second molars at the first or second visit.

The dentist was aware of the types of anesthetic, but the child and the parents were not. The study was performed as single-blind parallel trial. Only two primary mandibular second molars were treated for each child. The patients in Group I received 2% lidocaine with epinephrine 1:100,000 (Darby Dental Supply, LLC). Group II was injected with 4% articaine with epinephrine 1:100,000 (Septodont, France). First, the mucus was dry and the surface anesthesia was used to reduce the discomfort associated with the insertion of the needle into the mucous membrane. Benzocaine gel 20% (Benzotop 200 mg/gm, 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. A pediatrician started the pulpotomy treatment 15 minutes after the lidocaine block and 10 minutes after the articaine infiltration.[10] 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 VAS.[11] The teeth were then restored with amalgam or covered with stainless steel coating with appropriate size. After 24 hours of treatment, the patient was personally present to be examined for possible chewing of lips and cheeks. The pain was assessed through a 5-point rating scale, which had a 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, and (4) very severe pain (Fig. 1).

The children themselves reported these cartoon faces during the study. Thus, the parents and the dentist did not play a role in the report. After giving explanations on the scale, the children were requested to choose one of the faces that best reflect the inner feeling of them in that situation. Finally, the data were analyzed by SPSS (version 17) software using Mann–Whitney test for checking the VAS forms, and chi-square test for assessing the frequency of complications.

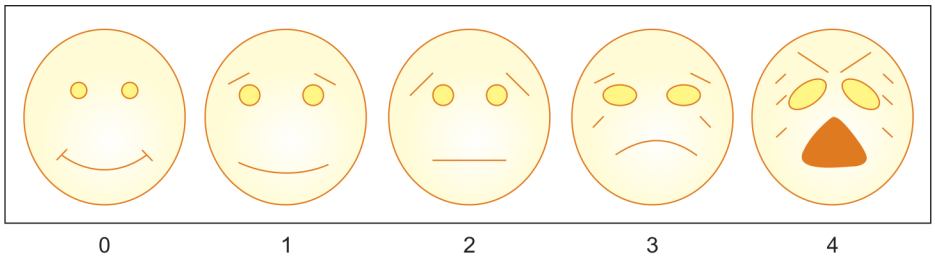

Fig. 1: Five-point rating scale of pain

Table 1: Determination and comparison of mean and median VAS score based on two groups in the age group of 6 to 8 years

Variables	*Mean ± standard deviation*	*Median*	*p-value*
Lidocaine	1.85 ± 1.08	2	<0.001
Articaine	0.55 ± 0.68	0	

Table 2: Determination and comparison of mean and median VAS score based on two groups in the age group of 8 to 10 years

Variables	*Mean ± standard deviation*	*Median*	*p-value*
Lidocaine	2.3 ± 1.26	2.5	<0.001
Articaine	0.4 ± 0.75	0	

Table 3: Determination and comparison of mean and median VAS score based on two groups between age groups of 6 to 8, and 8 to 10 years

Variables	*p-value*
Lidocaine	23/0
Articaine	51/0

RESULTS

The assessments were carried out for all 40 children aged 6 to 8 and 8 to 10 years who met the inclusion criteria. All children were randomly injected by articaine or lidocaine at the first or second visit. According to Table 1 and $p < 0.001$ of the Mann–Whitney test, the mean VAS score in the age group of 6 to 8 years was significantly different between the two groups.

In accordance with Table 2 and $p < 0.001$ of the Mann–Whitney test, the mean VAS score in the age group of 8 to 10 years was significantly different between the two groups.

According to Table 3, the mean VAS score between 6 and 8, and 8 and 10 years was not significantly different between the two groups.

DISCUSSION

The use of the self-reported VAS 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.[12] Several visual scales are available. The five-face VAS is the simplest tool for measuring successfully the effect of anesthetics in young children. The five-faces pain scale was used in this study to measure the pain. This scale has been used in previous studies as well.[10,13,14] On this scale, the pain after dentistry is scored from zero to four according to one's own perception.[15]

This study showed that articaine infiltration anesthesia could be used as a common method for the anesthesia of the primary mandibular second molars during the pulpotomy treatment. 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 complimentary injections for children, such as intrapulpal and periodontal ligament injections, which might be prescribed because of the failure of the nerve block.[16]

According to the studies, articaine is an anesthetic superior to lidocaine during restorative and pulpotomy treatments in children.[10,17] Articaine has been expressed to be the supreme anesthetic in the modern dentistry and the best choice in inflamed tissues.[18] Other studies found no significant difference between the administration of articaine and lidocaine anesthetics in children.[13] Limited studies have been conducted on the efficacy of articaine in children, and existing investigations have often been about the pain management after dental restorative operation. In addition, no studies have evaluated the efficacy of articaine after the pulpotomy treatment of the mandibular primary molars in children, while the pulpotomy treatment is a common but painful approach in children. The results of this study showed that articaine infiltration in children aged 6 to 8 and 10 to 8 years reduced the pain during pulpotomy treatment of the primary mandibular second molars.

The current study confirms the results of Kandasamy et al[19] and Malamed et al[10] who evaluated the pain during the dental restoration and complex operations. However, this study examined the effect of articaine during the pulpotomy treatment, and this anesthetic agent was more effective in reducing the pain compared with lidocaine. Kandasamy et al[19] examined the articaine effect on the removal of maxillary teeth with lidocaine in children. Malamed et al[10] also compared the effect of articaine with lidocaine during the restorative treatment and the pulpotomy treatment in children. Leith et al[7] also suggested that the lidocaine could be replaced with articaine buccal infiltration, and also the anesthetic acquisition with articaine is recommended in the patients with molar incisor hypomineralization. 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 articaine. In the present study, the investigations were performed in the mandible, and articaine operated more effectively in relieving the pain, suggesting high bone infiltration.

Ram and Amir[13] compared the efficacy of articaine and 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 than with lidocaine. This may be due to the fact that the parents recorded a time when the soft tissue anesthesia was lost. Moreover, 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,[14] the success rate of the IAN block was reduced in patients with irreversible pulpitis, and 30 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. Wright et al[20] 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. In the present study, articaine has been found to be more successful. The differences between the results of the study by Wright et al and our research may be due to the fact that Wright et al[20] examined only restorative treatment for the mandibular primary molars, as well as they used the standard error mean scale and Frankel scale to examine the pain, while we applied the self-report VAS that is a more valid measure. Oulis et al[21] investigated the effectiveness of mandibular infiltration compared with mandibular block anesthesia in treating primary molars in children and concluded that the nerve block injection was significantly more successful. This could be justified by the reason that Oulis et al[21] employed lidocaine for both types of nerve block and infiltration injections, but the present study used articaine that had a high bone infiltration and was more successful than the lidocaine nerve block. The nerve block infiltration has a high probability of failure due to anatomical variation of individuals.

Kanaa et al,[22] in a prospective randomized double-blind cross-over study on the efficacy of buccal infiltration with 4% articaine and 2% lidocaine (both with epinephrine 1:100,000) for pulpal numbness of mandibular first molar, concluded that 4% articaine infiltration was significantly more effective than 2% lidocaine. They used pulp tester to evaluate the depth of anesthesia. This study confirms the results reported by Kanaa et al,[22] with the difference that this study examined the effects of anesthesia in the pulpotomy treatment of the permanent teeth. This study was performed on the effects of anesthesia in the second molars during the pulpotomy treatment. Moreover, Kanaa et al[22] used the pulp tester to determine the anesthetic depth, which seems to be a more accurate method than the self-reporting of pain method used in this study. However, this test has inadequate reliability in children. It is difficult to assess the effects of anesthesia in children because their perception is limited to commands and verbal explanations of the pain.[16] The two methods used for assessing the pain in the studies include the pain reporting by the parents or the children themselves.[23] Previous studies have used the pulp tester to examine the dental anesthetic depth,[22] but this test in children is unreliable.[16]

CONCLUSION

This study suggests the use of local anesthetics with articaine in children aged 6 to 8 and 8 to 10 years as an effective approach to achieve deeper numbness during the pulpotomy treatment of primary mandibular second molar. However, the dentist should be careful about the overdose of this anesthetic.

REFERENCES

1. Ram D, Peretz B. Administering local anaesthesia to paediatric dental patients—current status and prospects for the future. Int J Paediatr Dent 2002 Mar;12(2):80-89.
2. Goddard JM, Pickup SE. Postoperative pain in children. Anaesthesia 1996 Jun;51(6):588-590.
3. Primosch RE, Antony SJ, Courts FJ. The efficacy of preoperative analgesic administration for postoperative pain management of pediatric dental patients. Anesth Pain Control Dent 1993 Spring;2(2):102-106.
4. Dean, JA. McDonald and Avery dentistry for the child and adolescent. 9th ed. Maryland Heights (MO): Mosby Elsevier; 2011. p. 243.
5. Venham L, Quatrocelli S. The young child's response to repeated dental procedures. J Dent Res 1977 Jul;56(7):734-738.
6. Sharaf AA. Evaluation of mandibular infiltration versus block anesthesia in pediatric dentistry. ASDC J Dent Child 1997 Jul-Aug;64(4):276-281.
7. Leith R, Lynch K, O'Connell AC. Articaine use in children: a review. Eur Arch Paediatr Dent 2012 Dec;13(6):293-296.
8. Fuks AB. Current concepts in vital primary pulp therapy. Eur J Paediatr Dent 2002 Sep;3(3):115-120.
9. Bigby J, Reader A, Nusstein J, Beck M, Weaver J. Articaine for supplemental intraosseous anesthesia in patients with irreversible pulpitis. J Endod 2006 Nov;32(11):1044-1047.
10. Malamed SF, Gagnon S, Leblanc D. A comparison between articaine HCl and lidocaine HCl in pediatric dental patients. Pediatr Dent 2000 Jul-Aug;22(4):307-311.
11. Baygin O, Tuzuner T, Isik B, Kusgoz A, Tanriver M. Comparison of pre-emptive ibuprofen, paracetamol, and placebo administration in reducing post-operative pain in primary tooth extraction. Int J Paediatr Dent 2011 Jul;21(4):306-313.
12. Shields BJ, Palermo TM, Powers JD, Grewe SD, Smith GA. Predictors of a child's ability to use a visual analogue scale. Child Care Health Dev 2003 Jul;29(4):281-290.
13. Ram D, Amir E. Comparison of articaine 4% and lidocaine 2% in paediatric dental patients. Int J Paediatr Dent 2006 Jul;16(4):252-256.
14. Aggarwal V, Jain A, Kabi D. Anesthetic efficacy of supplemental buccal and lingual infiltrations of articaine and lidocaine after an inferior alveolar nerve block in patients with irreversible pulpitis. J Endod 2009 Jul;35(7):925-929.
15. Gazal G, Mackie IC. A comparison of paracetamol, ibuprofen or their combination for pain relief following extractions in

children under general anaesthesia: a randomized controlled trial. Int J Paediatr Dent 2007 May;17(3):169-177.

16. Casamassimo, PS.; Fields, HW Jr.; McTigue, DJ.; Nowak, A. Pediatric dentistry: infancy through adolescence. 5th ed. St. Louis (MO): Elsevier Health Sciences; 2013. pp. 402-403.
17. Katyal V. The efficacy and safety of articaine versus lignocaine in dental treatment: a meta-analysis. J Dent 2010 Apr;38(4):307-317.
18. Nizharadze N, Mamaladze M, Chipashvili N, Vadachkoria D. Articaine-the best choice of local anesthetic in contemporary dentistry. Georgian Med News 2011 Jan;190:15-23.
19. Kandasamy S, Elangoran R, Rachel JR, Kumar CN. Removal of maxillary teeth with buccal 4% articaine without using palatal anesthesia—a comparative double blind study. J Oral Maxillofac Surg Med Pathol 2014 Apr;27:154-158.
20. Wright GZ, Weinberger SJ, Marti R, Plotzke O. The effectiveness of infiltration anesthesia in the mandibular primary molar region. Pediatr Dent 1991 Sep-Oct;13(5):278-283.
21. Oulis CJ, Vadiakas GP, Vasilopoulou A. The effectiveness of mandibular infiltration compared to mandibular block anesthesia in treating primary molars in children. Pediatr Dent 1996 Jul-Aug;18(4):301-305.
22. Kanaa MD, Whitworth JM, Carbett LP, Meechan JG. Articaine and lidocaine mandibular buccal infiltration anesthesia: a prospective randomized double-blind cross-over study. J Endod 2006 Apr;32(4):296-298.
23. Seymour RA, Hawkesford JE, Weldon M, Brewster D. An evaluation of different ibuprofen preparations in the control of postoperative pain after third molar surgery. Br J Clin Pharmacol 1991 Jan;31(1):83-87.