

A COMPARISON OF THE ANESTHETIC EFFICACY OF LIDOCAINE AND ARTICAINES FOR BUCCAL INFILTRATION IN PATIENTS WITH ACUTE IRREVERSIBLE PULPITIS IN MAXILLARY FIRST PREMOLARS

¹MUHAMMAD NABEEL, BDS, FCPS Trainee

²ALIA AHMED, BDS, FCPS

³MARIA SIKANDER, BDS, FCPS Trainee

ABSTRACT

Articaine is fast becoming the anesthesia of choice for many endodontists across the globe. Before it completely replaces the "gold standard" lidocaine its anesthetic efficacy for dental use must be determined accurately. The objective of this study was to compare the anesthetic efficacy of articaine with lidocaine for buccal infiltration in patients with acute irreversible pulpitis. Seventy-six patients with acute irreversible pulpitis of maxillary first premolar were randomly selected. Patients receiving 1.7 ml of 2% lidocaine with 1:100,000 epinephrine injection (group 1) and those receiving 1.7 ml of 4% articaine with 1:100,000 (group 2) were asked to rate their pain level on visual analogue scale (VAS) before receiving the anesthesia. Success was defined as mild or no pain on endodontic access or initial instrumentation based on the readings of visual analogue scale. Statistically no significant difference in the anesthetic efficacy of articaine and lidocaine as buccal infiltration agents was found. Hence, articaine hydrochloride has comparable anesthetic efficacy to that of lidocaine.

Key Words: Irreversible pulpitis, buccal infiltration, pulpal anesthesia, Visual analogue scale, Articaine, Lidocaine.

INTRODUCTION

Profound local anesthesia is necessary for successful patient management in endodontic therapy. Since the beginning of dentistry numerous compounds and methods have been tried and used to obtain anesthesia. Lidocaine hydrochloride became the first marketed amide local anesthetic and now it is considered the "Gold Standard" to which other anesthetic solutions are compared.¹ In 1969 a newer anesthetic drug Articaine was introduced as articaine. It contains a lipophilic thiophene ring than the usual benzene ring seen in other amide based local anesthetic solutions along with an additional ester ring. This unique property renders articaine better lipid soluble and increases its protein binding ability. Several studies have shown that 4% articaine has superior efficacy than 2% lignocaine as inferior blocking agent and mandibular buccal infiltration anesthesia.^{2,3,4} Same results were found in

maxilla when buccal infiltration with lidocaine and articaine was compared.⁵ Most studies have been carried out on sound teeth. Very little data is available on maxillary teeth with irreversible pulpitis. One study by Srinivasan et al⁶ showed success rate of 100% with articaine and 80% with lidocaine when used for pulpal anesthesia of maxillary premolars and 100% and 30% in molars respectively. No research data is available in Pakistan for efficacy of articaine in maxillary teeth with irreversible pulpitis. This study would enable us to select a better anesthetic solution for treatment of maxillary premolars.

METHODOLOGY

Approval from the ethical committee of the Islamic International Dental College and Hospital was obtained before undertaking the study. Informed consent was taken from the patients. Seventy-six patients reporting to the out-patient Department of Operative Dentistry and Endodontics at Islamic International Dental Hospital (IIDH) Islamabad diagnosed with irreversible pulpitis of maxillary first premolars were included in the study. They were assigned group 1 or 2 by using a computer-generated list of random numbers with randomization ratio of 1:1 produced by random allocation software (version 1.0). Patients taking any drugs that could alter the pain perception or patients suffering

¹ Department of Operative Dentistry, IIDC, Riphah International University. E-mail: nabeelabdhoo@yahoo.com Tel: 03215009424 Address: House No. 35, Street 38, F 8/1, Islamabad.

² Professor Operative Dentistry, IIDC, Riphah International University. Address: House No. 704, Street 70, I-8/3, Islamabad.

³ Trainee in Department of Operative Dentistry, IIDC, Riphah International University. Address: House No. 428, Street 16, Chaklala Scheme III, Rawalpindi.

Received for Publication: November 5, 2014

Accepted: November 22, 2014

from any allergy, heart disease, and diabetes mellitus were excluded from the study. Expecting and lactating mothers were also excluded.

Patients in group 1 received 1.7 ml of 2% lidocaine with 1:100,000 epinephrine (Dentsply) and patients in group 2 were given 1.7ml of 4% articaine with 1:100,000 epinephrine (Septodont) by buccal infiltration to gain pulpal anesthesia in maxillary first premolar. A single operator gave all local infiltration injections using standard dental aspirating syringes with 27-gauge, 1.5 inch needle and later did not took part in testing the outcome. A standard access cavity was made after 5 min of anesthetic administration. Endodontic procedure and pain recording using Visual Analogue Scale (VAS) was done by the other clinician throughout the study. Pain recorded more than 3 on VAS during access cavity or canal preparation was considered as failure and the procedure was stopped immediately. The readings on VAS were taken as: 0 for no pain, 1-3 for mild pain, 4-6 moderate pain and 7-10 as severe pain.

RESULTS

Seventy-six subjects participated in this study, aged between 18-67 years, out of which forty-three were female and thirty-three were male. Thirty-eight patients in group 1 and 2 each received lidocaine and articaine respectively. (Table 1 and Table 2)

On access cavity preparation and initial instrumentation (Table 3) 33 of the subjects who received lidocaine injection secured successful anesthesia whereas 35 of the subjects who received articaine injection experienced

TABLE 1: GENDER DISTRIBUTION FOR EFFICACY OF LIDOCAINE

		Gender		Total
		Female	Male	
Efficay	0 VAS	12	9	21
	1-3 VAS	4	8	12
	4-6 VAS	2	0	2
	7-10 VAS	2	1	3
Total		20	18	38

TABLE 2: GENDER DISTRIBUTION FOR EFFICACY OF ARTICAIN

		Gender		Total
		Female	Male	
Efficacy	0 VAS	10	12	22
	1-3 VAS	12	1	13
	4-6 VAS	1	1	2
	7-10 VAS	0	1	1
Total		23	15	38

TABLE 3: PAIN ON ACCESS CAVITY PREPARATION AND INITIAL INSTRUMENTATION

		Efficacy		Total
Count		Articaine	Lidocaine	
Pain	4-10 VAS	3	5	8
	0-3 VAS	35	33	68
Total		38	38	76

TABLE 4: CHI-SQUARE TESTS

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.559a	1	.455		
Continuity Correction ^b	.140	1	.709		
Likelihood Ratio	.564	1	.453		
Fisher's Exact Test				.711	.356
N of Valid Cases	76				

no or mild pain indicating that the local anesthesia was successful. Chi square test was used to compare the efficacy of the two anesthetic solutions. The difference between the two groups was not statistically significant ($p < 0.05$). Table 4

DISCUSSION

Numerous chemical substances have been used as local anesthetic agents in dentistry to make dental treatment a pain free procedure for the patients. The lidocaine, an amide local anesthetic, is widely used anesthetic solution since its introduction. The newer drug, articaine for local anesthesia has mechanism of blocking of reversible nerve conduction similar to that of other amide local anesthetics. However, the presence of thiophene group is thought to increases its lipid solubility.⁷ Numerous studies comparing the anesthetic efficacy of 4% articaine and 2% lidocaine have shown no significant differences among the two groups^{8,9} similar to the results in this study, while others have favoured the use of articaine.¹⁰

In this study we waited 5 minutes after the infiltration injections before access cavity preparation, which was based on the time suggested by previous studies for these injections to take full effect.^{11,12} The impacts of the anesthetics used were therefore maximized in this study.

Various studies have compared the effect of different volumes of local anesthetic solution and concentration of epinephrine in the success of anesthesia. Fowler S et al¹³ and Parirokh et al¹⁴ found no significant difference in anesthetic success between 3.6ml volume and 1.8 ml volume of 2% lidocaine for inferior alveolar nerve block in patients with symptomatic irreversible pulpitis. Wali et al¹⁵ found that increasing the concentration of epinephrine to 1:50,000 or volume of lidocaine to 3.6 ml did not result in more successful anesthesia. Therefore, in this study 1.7 ml of 2% lidocaine with 1:100,000 epinephrine was used compared with 1.7 ml of 4% articaine with 1: 100,000 epinephrine.

Objective quantification and standardization of pain across a group of individuals is a difficult task. Based on various studies, Visual analogue scale (VAS) was found to fulfill their established criteria because it is methodologically sound, theoretically simple, easy to run and unassuming to the respondent⁷. Dreven et al concluded that in irreversible pulpitis lack of response to electric pulp testing does not always guarantee successful pulpal anesthesia. If the chamber is necrotic and the canals are vital no objective test can determine the extent of clinical anesthesia¹⁶. Hence recording patient's response on access cavity preparation and initial instrumentation is a feasible alternative and therefore has been used in this study.

CONCLUSION

Based on the results of this study, the anesthetic efficacy of articaine is comparable to that of lidocaine in subjects with acute irreversible pulpitis of maxillary teeth with irreversible pulpitis. Articaine is a safe and viable alternative to secure pulpal anesthesia for endodontic therapy. However further research is needed to determine its efficacy in pediatric and geriatric patients.

REFERENCES

- 1 Malamed SF, Handbook of local anesthesia. 5th ed. St.louis: Mosby; 2004.
- 2 Tortamano IP, Siviero M, Costa CG, Buscariolo IA, Armonia IP. "A comparison of anesthetic efficacy of articaine and lidocaine in patients with irreversible pulpitis". J Endod 2009; 35(2):165-8.
- 3 Kanaa MD, Whitworth JM, Corbett IP, Meechan JG. "Articaine and lidocaine mandibular buccal infiltration anesthesia: A prospective randomized double-blind crossover study". J Endod 2006; 32:296-98.
- 4 Robetson D, Nusstein J, Reader A, Beck M, McCartney M. "The anesthetic efficacy of articaine in buccal infiltration of mandibular posterior teeth." J Am Dent Assoc 2007; 138:1140-12.
- 5 Kanaa MD, Whitworth JM, Meechan JG. A comparison of the efficacy of 4% articaine with 1:100,000 epinephrine and 2% lidocaine with 1:80,000 epinephrine in achieving the pulpal anesthesia in maxillary teeth with irreversible pulpitis. J Endod 2012; 38 (3): 279-82.
- 6 Srinivasan N, Kavitha M, Loganathan CS, Padmini G. Comparison of anesthetic efficacy of 4% articaine and 2% lidocaine for maxillary buccal infiltration in patients with irreversible pulpitis." Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009; 107:133-63.
- 7 Poorni S, Veniashok B, Senthilkumar AD, Indira R, Ramachandran S. Anesthetic efficacy of four percent articaine for pulpal anesthesia by using inferior alveolar nerve block and buccal infiltration techniques in patients with irreversible pulpitis: a prospective randomized double-blind clinical trial. J Endod. 2011 Dec; 37(12):1603-07.
- 8 Claffey E, Reader A, Nusstein J, Beck M, Weaver J. Anesthetic efficacy of articaine for inferior alveolar nerve blocks in patients with irreversible pulpitis. J Endod. 2004 Aug;30(8):568-71.
- 9 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):925-29.
- 10 Katyal V. The efficacy and safety of articaine versus lignocaine in dental treatments: a meta-analysis. J Dent. 2010 Apr; 38(4):307-17.
- 11 Vreeland DL, Reader A, Beck M, et al. An evaluation of volumes and concentrations of lidocaine in human inferior alveolar nerve block. J Endod 1989; 15:6-12.
- 12 Robertson D, Nusstein J, Reader A, et al. The anesthetic efficacy of articaine in buccal infiltration of mandibular posterior teetg. J Am Dent Assoc 2007; 138:1104-12.
- 13 Fowler S, Reader A. Is the volume of 3.6ml better than 1.8 ml for inferior alveolar nerve blocks in patients with symptomatic irreversible pulpitis? J Endod 2013; 39: 970-02.
- 14 Parirokh M, Satvati SA, Sharifi R et al. Efficacy of combining a buccal infiltration with an inferior alveolar nerve block for mandibular molars with irreversible pulpitis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010; 109: 468-73
- 15 Wali M, Drum M, Reader A et al. Prospective, randomized single-blind study of the anesthetic efficacy of 1.8 and 3.6 milliliters of 2% lidocaine with 1:50,000 epinephrine for inferior alveolar nerve block. J Endod 2010; 36: 1459-62.
- 16 Dreven LJ, Reader A, Beck M, Meyers WJ, Weaver J. An evaluation of an electric pulp tester as a measure of analgesia in human vital teeth. J Endod 1987; 13(5):233-38.