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Articaine (4%) Buccal Infiltration versus Lidocaine (2%) Inferior Alveolar Nerve Block for Mandibular Teeth Extraction in Patients on Warfarin Treatment

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Abstract

Background: Although lidocaine inferior alveolar nerve block is a common dental injection in case of managing mandibular teeth, it may not be the first choice in specific situations. Patients on warfarin therapy are at high risk of bleeding during dental procedures. In this study we aimed to investigate and compare the efficacy of articaine buccal infiltration in mandibular teeth extraction with lidocaine inferior alveolar nerve block for extraction of mandibular teeth in patients on warfarin treatment.

Methods: Patients included in the present study were on warfarin treatment and referred for simple dental extraction. Patients were divided randomly in two groups, one group received standard inferior alveolar nerve block (1.8 ml of 2% lidocaine with 1:80,000 adrenaline) and the second group received buccal infiltration supported with lingual infiltration using 4% articaine and 1:100,000 adrenaline. Data was analyzed by descriptive analysis using SPSS program V.17. A Mann-Whitney U test to compare the results and p value of less than 0.05 was considered significant.

Results: A total of 23 adult patients (10 women and 13 men) aged 40 to 57 years (mean=48.9) were recruited into the study with 6 excluded as they needed a second local anesthetic cartridge to obtain profound anesthesia. The success rate of inferior alveolar nerve block using lidocaine was 81.8% while the success rate for articaine buccal infiltration in obtaining good profound pulpal anesthesia was 66.6%. Both surgeons and patients were satisfied with anesthesia using both drugs.

Conclusion: Buccal infiltration of 4% Articaine for mandibular teeth can have a high success rate using one local anesthetic cartridge, and is considered a good alternative option for nerve block in patients on warfarin treatment to avoid complication related to the nerve block.

Keywords: Articaine; Extraction; Infiltration; Lidocaine; Warfarin

Introduction

Local anesthetics are the most commonly used injectable drugs in dentistry to irreversibly block nerve conduction. Articaine is an amide local anesthetic with high lipid solubility due to the thiophene ring it contains [1]. It also contains an ester group which makes enable its hydrolization in plasma. The mechanism of action of this drug is similar to other local anesthetics where it binds to the sodium potassium channels and prevents action potential at the nerve cell [2]. Articaine has high protein binding capacity (94%) which helps in keeping the drug for longer period and increases its duration of action. The drug has been widely used in the field of dentistry. Although articaine was related to permanent paraesthesia, it has been shown that it is safe and very effective local anesthetic [3]. The drug started to gain respect for its effectiveness in infiltration for management of pulpitis in mandibular teeth where the failure rate with inferior alveolar nerve block ranges from 44 to 81% [4]. The success rate of obtaining anesthesia by buccal infiltration of mandibular first molar by articaine ranged in the literature from 54 to 94% [5-7]. Although lidocaine inferior alveolar nerve block is a common dental injection in case of managing mandibular teeth, it may not be the first choice in specific situations. Patients on warfarin therapy are at high risk of bleeding during dental procedures [8]. Such patients need special precautions in their management including monitoring the international normalized ratio (INR) [9]. It is also advisable to avoid regional nerve block as this may cause bleeding and hematoma in such patients [10]. It has been shown that articaine buccal infiltration with lidocaine inferior alveolar never block is superior to the block alone [11]. Comparison of the efficacy of articaine and lidocaine in case of mandibular teeth infiltration showed that articaine is more effective [12]. It has been reported that pulpal anesthesia of the mandibular first molar can be achieved better with infiltration by articaine rather than by the inferior alveolar nerve block using lidocaine [5-13]. The mechanism of effectiveness of articaine in infiltration is not fully understood but could be due its better diffusion capability [14,15].

In this study we aimed to investigate and compare the efficacy of articaine buccal infiltration in mandibular teeth extraction with lidocaine inferior alveolar nerve block for extraction of mandibular teeth in patients on warfarin treatment.

Patients and Methods

Patients included in the present study were on warfarin treatment

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and referred to the Department of Oral and Maxillofacial Surgery for simple dental extraction. Inclusion criteria included patients on warfarin treatment who needed simple tooth extraction and able to understand the pain scale. Exclusion criteria included any patient with INR >4, any history of liver disease or any other coagulopathies, and any patient refused to sign the consent or refused to participate in the study after discussing the research proposal with all possible complications. Any patient with history of allergy to local anesthetic drugs or any content of the local anesthetic cartridge was also excluded from the study. The treatment procedure included measuring patient's and surgeon's satisfaction with the anesthesia efficacy during the procedure and also measuring patient's pain during the treatment using visual analogue scale.

Patients were divided randomly in two groups, one group received standard inferior alveolar nerve block (1.8 ml of 2% lidocaine with 1:80,000 adrenaline, DENTSPLY pharmaceutical) and the second group received buccal infiltration supported with lingual infiltration using 4% articaine and 1:100,000 adrenaline (Germany). All injections were carried out using aspirating dental syringe and 27 gauge needles. One surgeon performed the injection while the other surgeon performed the extraction and recorded his satisfaction score without knowing what local anesthetic solution or injection technique was used. Patients also don't know the type of anesthetic solution and if more than one local anesthetic cartridge was needed during the treatment, the patient was excluded from the study. The CoaguChek System (Roche Diagnostics, USA) was used to identify the INR on the same day of dental extraction. Each patient was subjected to a simple one tooth extraction. No local or systemic hemostatic measures were used in these patients except gauze pressure pack on the extraction site for 30 minutes after extraction. The research was approved by the ethical committee, the College of Dentistry Research Centre, King Saud University. Data was analyzed by descriptive analysis using SPSS program V.17. A Mann-Whitney *U* test to compare the results and *p* value of less than 0.05 was considered significant.

Results

A total of 23 adult patients (10 women and 13 men) aged 40 to 57 years (mean=48.9) were recruited into the study with 6 excluded as they needed a second local anesthetic cartridge to obtain profound anesthesia. The success rate of inferior alveolar nerve block using lidocaine was 81.8% while the success rate for articaine buccal infiltration in obtaining good profound pulpal anesthesia was 66.6%. Patients recorded pain score range from zero to 4 when articaine was used and from zero to 3 when lidocaine was used (Table 1).

According to the visual analogue pain scale, three patients out of 9 were completely pain free without any discomfort during extraction when lidocaine was used compared to 1 patient in the articaine group. Surgeons were satisfied with anesthesia in both groups and gave score of 4 to 5 in all cases (Table 2). Mann-Whitney test showed that there was no significant difference of surgeon's satisfaction using either articaine of lidocaine ($P>0.05$). Patients gave satisfaction scores from 3 to 5 with score 3 mainly for articaine group (Table 3). Testing the difference in patient's satisfaction using Mann-Whitney showed no significant difference in the two groups. There was no statistically significant difference in the failure cases in both lidocaine and articaine groups ($P>0.05$).

Discussion

The present study compared the efficacy of 4% articaine (1:100,000 adrenaline) as buccal infiltration supported with lingual nerve block with inferior alveolar nerve block using 2% lidocaine (1:80,000 adrenaline) in case of simple extraction of mandibular posterior teeth. The inferior alveolar nerve block is the most commonly used injection technique to anesthetize lower teeth [16-17]. Such technique involves the insertion of the needle near the inferior alveolar nerve where it enters the mandibular foramen with its vascular bundles. Injection in such area may cause bleeding and hematoma in susceptible patients [8]. The formation of hematoma at this anatomical position may cause airway problems and lead to obstruction [18]. Patients on warfarin therapy are at high risk of bleeding in case of surgical procedures and the use of nerve block techniques is not advisable in these patients as the carry the risk of hematoma formation [10]. Articaine is a widely used local anesthetic which has been proved to be as effective as lidocaine and has longer duration of action [3]. Buccal infiltration of articaine has been shown to be effective in anesthetizing mandibular first molars teeth [5]. It was also reported that articaine is more effective in infiltration than lidocaine [12]. In the present study we showed that the success rate of obtaining anesthesia by buccal infiltration using 4% articaine was 66.6% using only one of the 1.8 ml of local anesthetic cartridge. When one cartridge was not enough to obtain profound local anesthesia another cartridge was used effectively in some cases in the present study, but they were excluded and considered failure. This is not considered a real failure as the maximum dose of 4% articaine is 7.0 mg/kg which is equal to a total of 7 cartridges for adult healthy patients [19]. But for the comparison in this current study we considered it as failure when compared to using one cartridge of lidocaine.

Although it has been shown that increasing the volume of articaine in infiltration does not increase the success rate, in our present study

		Pain score						Total	P value
Local anesthetic		**0.00**	**1.00**	**2.00**	**3.00**	**4.00**	**Needed second injection**		
	Lidocaine	3	3	2	1	0	2	11	0.23
	Articaine	1	3	1	2	1	4	12	
Total		4	6	3	3	1	6	23	

Table 1: Patients pain score.

		Surgeon's Satisfaction			Total	P value
Local anesthetic		**4.00**	**5.00**	**Needed second injection**		
	Lidocaine	4	5	2	11	0.21
	Articaine	6	2	4	12	
Total		10	7	6	23	

Table 2: Surgeon's satisfaction.

		Patient's Satisfaction				Total	P value
Local anesthetic		**3.00**	**4.00**	**5.00**	**Needed second injection**		
	Lidocaine	0	6	3	2	11	0.07
	Articaine	3	4	1	4	12	
Total		3	10	4	6	23	

Table 3: Patient's satisfaction.

all failed cases using one cartridge of articaine were successfully anesthetized using a second 1.8 ml cartridge of the drug. Such observation is supported by a recent report investigated the effect of increasing the articaine volume in buccal infiltration in mandibular posterior teeth [20-21]. Taking in consideration those patients on warfarin treatment could be at risk of having bleeding and developing hematoma after inferior alveolar nerve block, infiltration using articaine with its present success rate using one cartridge is considered an alternative option to avoid such complications. In the present study surgeons were satisfied with efficacy of both lidocaine and articaine and there was no statistically significant difference between the two tested drugs. The same results were found in patient's satisfaction and pain visual analogue scores.

One of the reported nerve block complications of articaine is permanent paresthesia due to the proximity of nerve truck to injection area [22]. Such complication can be avoided using the infiltration technique which was used in the present study. The risk of intravascular injection in case of nerve block can also be reduced in case of infiltration technique and using aspirating syringe. The higher success rate of articaine when compared to lidocaine in case of local anesthetic infiltration may be due to its chemical composition and its high lipid solubility due to the presence of thiophene ring instead of the usual benzene ring as in other local anesthetics [23]. Such high lipid solubility enhances the ability of the drug to penetrate the cortical bone plates of the mandible. It has been shown that anesthesia of the second and third mandibular molars can be achieved by infiltration of articaine in first mandibular molar region and this may support the idea the high penetration capability of the drug reaching the mandibular canal and anesthetizing the nerve distally [21]. The potency of articaine in infiltration was reported in anesthetizing maxillary teeth with single buccal infiltration without the need for palatal anesthesia as the drug was able to penetrate the bone effectively and reach the other side [24].

Although the present study is considered double blinded as the surgeon's satisfaction was evaluated by other surgeon who does not know which drug was sued, it may not be possible to ensure this as the patients may be able to differentiate between the two injections (nerve block and infiltration) as their injection locations are different. But still patients in the present study don't know which drug was used for the anesthesia. Few of the treated patients in the present study had moderate bleeding postoperatively and needed local hemostatic measures to control it. The present study may be enough to support using 4% articaine infiltration for extraction of mandibular posterior teeth using infiltration technique supported with lingual nerve anesthesia in patients on warfarin treatment. This should be tested in longer surgical procedures as we have tested it in only simple extraction cases.

Conclusions

Buccal infiltration of 4% Articaine for mandibular teeth can have a high success rate using one local anesthetic cartridge, and is considered a good alternative option for inferior alveolar nerve block in patients on warfarin treatment to avoid complication related to the nerve block.

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