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Comparison of efficacy and post injection parasthesia between articaine and lidocaine in local anesthesia for inferior alveolar nerve block

Meghdad Khanian Mehmandoust

DDS, Oral and Maxillofacial Surgeon, Jondishapour University of Medical Sciences, Ahvaz, Iran

Kiavash Kadivar

DDS, Bushehr University of Medical Sciences, Bushehr, Iran

Sina Salehin*

DDS, Oral and Maxillofacial Radiology Resident, Jondishapour University of Medical sciences, Ahvaz, Iran

Ehsan Ghorbani

Student Research Committee of Bushehr University of Medical Sciences, Bushehr, Iran

Mehran Erfanmanesh

DMD, Dento-alveolar Surgeon, University of Pécs, Department of Dentistry, Oral and Maxillofacial Surgery

Abstract---Puepose: Considering the high failure rate of using lidocaine in the lower jawbone block and the recommendation of some researchers regarding the use of articaine, and considering the contradictions and the lack of adequate and reliable evidence for comparing these two drugs, we found a study on comparing the effects and side effects of these two anesthesia. Methods: In a double-blind, randomized controlled trial, the effect and side effects of articaine 4% and lidocaine 2% with epinephrine 1 in 100000 units were compared in lower Jaw nerve block. 110 patients with molar tooth extraction were entered our study and divided into two groups of 55 subjects. Patients in case group received 4% articaine anesthesia in lower jaw block and Patients in control group received 2% lidocaine anesthesia in lower jaw block. The onset of the effect of anesthetics, the success rate of inducing complete anesthesia+, duration of anesthesia, patient's pain during surgery, and anesthetic stability

(paresthesia) after 24 hours and one week were investigated in these two groups. Results: In this study, there was no significant difference in the onset time of anesthesia, the degree of success in inducing anesthesia and the probability of occurrence of paresthesia after injection, between the case and control groups. However, in the group receiving articaine, the duration of anesthesia was significantly higher and the pain score was less than that of the lidocaine group. Conclusion: According to the statistical data obtained from this study, it seems that articaine 4% anaesthetic drug produces longer and stronger anesthesia in lower jaw than lidocaine 2%.

Keywords--local anesthesia, articaine, lidocaine, inferior alveolar, nerve block, paraesthesia.

Introduction

The basis of pain control in dentistry is inducing successful anesthesia. Since the apex of maxillary teeth is not surrounded by a dense bone, inducing acceptable maxillary anesthesia is rarely encountered (success rate of 95% or more), but it is more difficult to induce successful pulpal anesthesia in the mandibular teeth, which are in dense bone(1). The most common and most important method of injecting a nerve block in dentistry is Inferior alveolar nerve block (IANB) technique(1), but unfortunately due to limited access to the nerve, it also has the highest failure rate among all dental block injections (20-20% failure rate)(1-3). Hence, many studies aimed to increase the success of IANB technique, like devising methods to increase technique accuracy(4-6), finding alternative techniques instead of the usual technique(7-10) and changing anesthesia drug(11-13).

Lidocaine 2% is the most common and gold standard anesthetic (1). Since lidocaine was introduced in 1943, numerous anesthetics have been introduced and used. Articaine (Karthicain) is a relatively new anesthetic that has entered dental field recently. The high solubility of this substance in fat increases its permeability to the lipid membrane of the nerves and increases its anesthetic potency(14-17). Since the introduction of articaine in the United States, incidence of paresthesia has increased (usually in mandible)(1). Haas DA, in a retrospective study for 21 years, concluded that articaine and prilocaine were the most cause of paresthesia(18). Many dentists now believe that articaine can be a good choice instead of lidocaine in dental procedures. So, some research has been done to compare articaine and other local anesthetic drugs specially lidocaine. Therefore, due to the high failure rate of lidocaine in IANB, we have compared the efficacy and side effects of articaine and lidocaine in IANB.

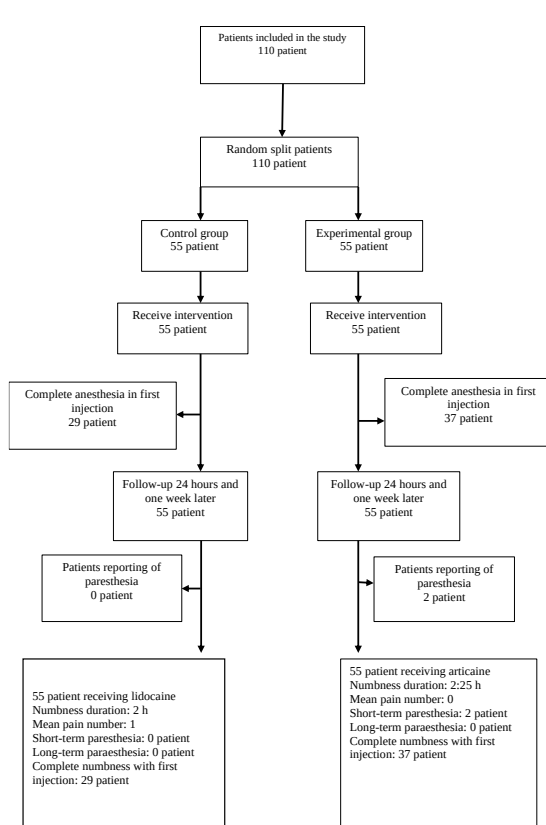
Materials and Methods

In this randomized double-blind controlled clinical trial, the effect of articaine 4% and lidocaine 2% with 1:100000 epinephrine in IANB injection was investigated. 110 patients between 20-50 years, who were referred to clinic for nonsurgical extraction of their mandibular molars, were divided into two groups of 55 each.

Anesthesia injections were performed according to the standard Malamed technique(1). 7 minutes after anesthesia injection, the patient was asked to announce the start time of the anesthesia by touching the lower lip. Also, to evaluate the success of anesthesia, a sterile needle was inserted into the patient's lip 10 minutes after injection. If the patient had pain from the above-mentioned operation, another carpul of the anesthetic was injected and re-tested after 10 minutes. If the patient still expressed pain from needle insertion, he would be excluded, if patient had no pain, tooth extraction would be performed. To assess the duration of anesthesia, the patients were asked to indicate the level of anesthesia with elimination lower lip anesthesia or filling pain. 24 hours after injection, we called the patients to see if their lower lip still had complete or partial anesthesia. All patients were also re-examined a week later to check for stable paraesthesia.

Results

110 patients, including 55 in the experimental group (Articaine) with mean age of 41 years and 55 patients in the control group (lidocaine) with a mean age of 42 years entered the study. There was no significant difference in sex ratio between two groups (P-value = 0.43). There was no significant difference between groups in terms of anesthesia onset (P-value = 0.26). But duration of anesthesia in the experimental group was significantly longer than the control group (P-value = 0.0001). The mean duration of anesthesia in the control group was 2:00 h and in the experimental group was 2:25 h. Pain score (VAS) in the experimental group was significantly lower than the control group. The mean pain score in the control group was 1 and in the test group was zero.



There were 29 patients (52.7%) in control group and 37 patients (67.3%) in experimental group with complete lower lip numbness and there was no statistically significant difference between them (P -value = 0.11). All patients had complete lower lip numbness after second injection. 24 hours of patients' follow-up after the intervention showed that only 2 patients of the experimental group (3.6%) still had short-term paresthesia, but none of the control group was affected and there was no significant difference between two groups (P -value = 0.15). None of the patients had long-term numbness after one week.

Discussion

The IANB is the most common and most important nerve block injection method in dentistry(1). But due to limited nerve access, it also has the highest failure rate among all dental block injections (Failure rate = 15-20%) (1-3). Lidocaine 2% is a common anesthetic drug in many countries. Articaine is also a relatively new anesthetic drug that has entered to dental field in recent decades and it can be used instead of lidocaine. So, many studies have aimed to compare articaine efficacy and side effects with other anesthetic drugs(19-22). While some researchers reported the superiority of articaine, others did not observe significant difference (23-26). A 2011 meta-analysis compared the efficacy of articaine and lidocaine and showed articaine had relative advantage in infiltration injections, but this advantage was reduced in IANB, and there was no difference

between the efficacy of these two drugs on symptomatic teeth(27). On the other hand, increasing reports of paresthesia after injecting articaine (specially IANB), has given rise to a strong belief between dentists that there is a relationship between articaine injection and paresthesia(18), the belief has recently been questioned by a considerable number of studies(28-30).

In the present study, there was no significant difference between the experimental and control groups regarding the time of onset of anesthesia and the number of patients with complete lower lip anesthesia in the first stage, so, there was no significant difference between two drugs in the success rate of anesthesia. On the other hand, anesthetic duration in the experimental group was significantly longer than the control group. In addition, the pain score (VAS) in the experimental group was significantly lower than the control group, this difference between the pain scores of two groups indicates that anesthesia-induced by articaine 4% was greater than lidocaine 2%. The results of this study were in line with the results of several other studies, although they have reported different results in comparing different variables, but they collectively indicated the superiority of articaine to lidocaine (31-33).

Tortamano et al. compared anesthetic power of lidocaine and articaine in IANB in 40 patients with irreversible pulpitis and showed no significantly difference between them (26). In the present study, two patients of the experimental group (3.6%) had short-term paresthesia, whereas no one in the control group experienced the same complication. So, there is no significant difference between two groups. It cannot be confirmed that there is no association between articaine and paresthesia incidence. Based on the results of this study, articaine produced longer and stronger anesthesia than lidocaine. According to failure rate of IANB, it is recommended to use articaine 4% in dental procedures in mandible, especially in mandibular molar extraction. So, further studies are needed to evaluate the relationship between articaine and paresthesia incidence.

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