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Anesthetic efficacy of Articaine 4% during extraction of the first and second lower molar by using inferior alveolar nerve block and buccal infiltration techniques

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Abstract
Purpose: The study was designed to evaluate the anesthetic efficacy of 4% articaine with 1:100000 adrenaline in infiltration and inferior alveolar nerve block (IANB) anesthetic techniques for the pain control during extraction of the mandibular posterior teeth.
Materials and Methods: This crossovee clinical trial included 40 patients needing extraction of mandibular molar in both side. Patients received infiltration in the buccal vestibule opposite to the first molar supplemented with lingual infiltration in one side and standard IANB in other side with 4% articaine with 1:100000 adrenaline. For assessment of depth of anesthesia obtained by the two anaesthetic techniques, presence or absence of pain during the extraction were rated using the visual analog scale.
Results: forty patients received infiltration anesthesia in one side and IANB in the other side. The success rate of pain-free extraction after buccal infiltration was 72.5%, whereas by using IANB with the same anesthetic it was 82.5%. No statistical differences were detected in the success rates between the two anesthetic techniques (P = 0.65).
Conclusions: Buccal Infiltration can be considered a good option during extraction of the mandibular molar and premolar teeth of course, with supplemental lingual anesthesia.

Keywords: Articaine, Mandibular molars, Infiltration, Nerve block

1. Introduction

Pain control considered essential in most dental aspects, and that was possible since the use of local anesthetics such as cocaine in 1884 [1]. In 1943 Lofgren demonstrated Lidocaine as the first amid local anesthesia drug. Currently, Lidocaine considered as the most local anesthetics in use, and the standard for other local anesthetics [2]. Infiltration anesthesia is the common method used to anesthetize maxillary teeth, but mandibular molars are usually anesthetized by Inferior Alveolar Nerve Block (IANB) injection [3, 4]. However, IANB injection had some disadvantages like absence of consistent anatomical landmarks and high failure rate; it was helpful to find a simpler way to anesthetize the mandibular posterior teeth [5, 6]. A number of study have shown the superiority of 4% articaine to 2% lidocaine, both with 1:100000 adrenaline when used as buccal infiltration of the mandibular posterior teeth [7, 8]. Additional studies compared the depth of pulpal anesthesia in the mandibular molars obtained after buccal infiltration by articaine to that obtained after the inferior alveolar nerve block (IANB) with 2% lidocaine and found a similar success rate for both of them [9]. Another studies demonstrated that articaine by buccal infiltration in the mucobuccal fold of the first mandibular molar can provide more successful anesthesia to mandibular teeth when administrated with lidocaine or articaine [10, 11]. The aim of the study was to compare the pain intensity when use 4% articaine with 1:100000 adrenaline as local anesthetic in tow anesthesia techniques (Buccal infiltration, IANB injection) during mandibular posterior teeth extraction. The null hypothesis of the present study was that the infiltration of 4% articaine with 1:100000 adrenaline in the buccal vestibule of the lower molars will be as effective as IANB with the same anesthetics during extraction of the mandibular posterior teeth.

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2. Materials and Methods

This crossover comparative study was performed at the Maxillofacial Surgery Department, Faculty of dentistry, Hama University, Hama, Syria. The study sample consisted of 40 patients, 19 to 52 years of age and a mean age of 29.67 years, with the following inclusion criteria: (1) Patient who had first or second molar indicated for extraction in both side. (2) Age over 18 years old. (3) Good health with no systemic diseases. (4) Cooperated patient. The exclusion criteria were: (1) Loose teeth, (2) Very small remaining roots, (3) Patient with allergy to local anesthetics, (4) Third molars.

After diagnosis and taking medical history, details of the treatment were discussed with the patients and an informed consent agreement was signed by them. For each patient, the extraction was done in two visits, one side for each visit with 10 days intervals. In one visit IANB injection with articaine and 1:100000 adrenaline (Astracaine Dental, Germany) was used, and in other visit, buccal infiltration with the same anesthetic was used. The anesthesia technique for each side was selected randomly. In first visit patient received a standard IANB injection with 1.5 mL of anesthetic, then 0.3 mL was used for long buccal injection in the mucobuccal fold distal to the tooth to be extracted. For second visit, 1.5 mL of the same anesthetic was administrated in depth of the mucobuccal fold opposite to the mandibular first molar. For the lingual soft tissue anesthesia, 0.3 mL of the same anesthetic was deposited under the lingual mucosa opposite to the tooth to be extracted. The tooth that was indicated for extracted was removed in standard protocols of extraction (Fig1).

Fig 1: Clinical case to first lower molar extraction

2.1. Evaluation of pain intensity

Before the extraction, each patient was instructed on how to rate any pain that may be felt during the extraction using a Heft-Parker visual analog scale (VAS) [12]. VAS used was a 170-mm line with various descriptive terms. The subjects placed a mark on the scale where it best described their pain level. To interpret the data, the VAS was divided into the following 4 categories:

No pain corresponded to 0 mm on the scale; mild pain was defined as >0 and <54 mm, which included descriptors of faint, weak, and mild pain; moderate pain was defined as <54 and >114 mm; severe pain was defined as ≥114 and included the descriptors of strong, intense, and maximum possible. Subjects recorded the pain scores immediately after the surgery.

Pain-free treatment was defined as no pain or mild pain felt by the patient or discomfort noticed during the surgery. If any patient felt pain during the surgery and the reported pain on VAS was >54 mm during his pain assessment, the technique was considered unsuccessful. Those patients who experienced pain during the extraction categorized as failure of pain-free treatment, and managed according to the best local practice, with further supplementary injections as needed.

3. Results

Forty patients were recruited to participate in this study, 23 patients were male (57.5%) and 17 patients were female (42.5%) and the mean age was 29.67 years old. In assessment of pain intensity during extraction. (60%) of patients had mild pain, (25%) of patients had moderate pain, (2.5%) of patients had severe pain, and (12.5%) of patients had no pain in buccal infiltration group. elsewhere, in IANB group (75%) of patients had mild pain, (15%) of patients had moderate pain, (2.5%) of patients had severe pain, and (7.5%) of patients had no pain (Table1) (fig2).

Table 1: Frequency and percentage to pain intensity in groups of study

Pain Intensity	Buccal Infiltration		IANB	
	Frequency	Percentage	Frequency	Percentage
No pain	5	12.5%	3	7.5%
Mild pain	24	60.0%	30	75.0%
Moderate pain	10	25.0%	6	15.0%
Severe pain	1	2.5%	1	2.5%
Total	40	100%	40	100%

For statistical analysis, Mann-Whitney U Test was used. The differences between groups of the study were not statistically significant (Table 2).

Table 2: Mann-Whitney U Test for statistical analysis

Groups	Rank mean	P-Value
Buccal infiltration	41.18	0.650
IANB	39.52	

4. Discussion

Lidocaine hydrochloride has maintained its status as the most widely used local anesthetic in dentistry since its introduction. Proven efficacy, low allergenicity, and minimal toxicity through clinical use and research have confirmed the value and safety of this drug. Thus, it became labeled the gold standard to which all new local anesthetics are compared. Despite the gold standard status of lidocaine hydrochloride, numerous reports have advocated the use of articaine hydrochloride as a superior anesthetic agent, primarily on the basis of its enhanced anesthetic potency, which is 1.5 times greater than that of lidocaine, with faster onset and increased success rate [2]. Although articaine shows no advantage over lidocaine as an inferior dental nerve block, articaine buccal infiltrations have been reported to have a higher anesthetic success rate in molars and premolars than lidocaine [3, 8]. However, none has compared IANB with buccal Infiltration, both with articaine during extraction of mandibular molars and premolars.

The results of the present trial indicate that buccal infiltration of articaine produced success rates similar to that of IANB of articaine for pain control during extraction of lower molar and premolar teeth. The definition of successful anesthesia was defined as pain-free treatment. This is different to other studies that defined successful anesthesia as an absence of response to the pulp test reading of 80 [13]. Absence of response to electrical pulp testing up to reading of 80 is considered as one of important signs for successful anesthesia for the teeth with vital pulp. However, subjective symptoms as lip numbness and absence of pain during the treatment are more practical and easily applicable methods to test efficacy of the anesthesia, especially when the tooth or teeth to be extracted are non-vital, no electric pulp tester available, or to avoid false results that may occur with the electric pulp tester [14].

5. Conclusion

From the present study it can be concluded that buccal infiltration and IANB were equally effective when use articaine 4% as anesthetic. Buccal infiltration with articaine 4% could be used as a good option for extraction of the mandibular posterior teeth, of course, with supplemental lingual anesthesia.

6. References

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