



## THE EFFICACY OF ARTICAINA LOCAL ANESTHETIC IN IMPACTED LOWER THIRD MOLAR SURGERY (A CLINICAL STUDY)

<sup>1</sup>Ashour Sheeba Toma, <sup>2</sup>Omer W. Majid, <sup>2</sup>Wael Sh. Shallawe

<sup>1</sup>Department of Oral and Maxillofacial surgery, <sup>2</sup>Asst.prof in Department of Oral And Maxillofacial surgery, College of Dentistry, University of Mosul, Iraq.

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### ABSTRACT

Articaine is an intermediate-potency, short-acting amide local anesthetic with a fast metabolism due to an ester group in its structure. It is effective with local infiltration or peripheral nerve block in dentistry. Articaine was synthesized by Rusching et al. in 1969 with the name of carticaine, and was first marketed in Germany in 1976. To evaluate the efficacy of articaine local anesthetic in impacted lower third molar surgery. (Regarding onset, duration and pain during and after surgery). To analyze hemodynamic changes following the administration of 4% articaine with epinephrine 1:80,000 in the surgical removal of impacted lower third molars. These included surgical set for minor oral surgical procedure, Electrocardiogram (Monitor) (figure 2), pulp tester. (Figure 2) and timer. In addition to some medications that used in the study (Ibuprofen tab 400 mg, Amoxicillin cap 500 mg and Metronidazole tab 500 mg). A standardized surgical procedure was performed on all patients. A standard inferior alveolar and long buccal nerve block was given using 2 cartridges of 4% articaine with epinephrine 1:80 000.Surgical access routinely achieved through a triangular full thickness flap (Fig.3).After tooth delivery we do suturing (fig.6).pain was evaluated using visual analogue scale (VAS).By using the Electrocardiograph (monitor) we measure the blood pressure (systolic and diastolic), heart rate and mean arterial pressure (MAP). Articaine local anesthetic shows significant reduction of pain during surgical extraction of impacted lower wisdom tooth the patient feels no pain according to the (VAS) the mean is (0.37) in addition articaine local anesthetic shows no effects on systolic pressure during injection. Articaine in 4% solution with 1:80,000 epinephrine showed a significant reduction of pain and rapid onset of action with little or no effects on the cardiovascular system during surgery. Articaine can be recommended as safe alternative anesthetic to lidocaine local anesthetic in third molar surgery.

### INTRODUCTION

Surgical extraction of impacted mandibular third molars is a common oral surgical procedure [1], and it is

often attended by complications, which are distressing to patients [2]. Pain is a protection mechanism of the body to a tissue injury by different stimulations, which transmit a signal to the Central Nervous System [3]. Dental pain is usually originated from acute inflammatory nature and it compels the patient for seeking professional help. On the other hand, surgical interventions in dentist office may also induce pain in the postoperative period of previously

Corresponding Author

**Ashour Sheeba Toma**

Email: - [Ashour.alkasrany@yahoo.com](mailto:Ashour.alkasrany@yahoo.com)



asymptomatic patients [4]. Pain reduction has been the subject of continuous research in the field of oral and maxillofacial surgery since postoperative pain with ranging of intensity and duration may affects the patient submitted in an oral surgical procedure. Therefore, a method to decrease or eliminate patient pain has its usefulness justified [5]. Articaine hydrochloride (HCl), or 4-methyl-3-[1-oxo-2-(propylamino)- propionamido ]-2 -thiophene-carboxylic acid methyl ester hydrochloride, was synthesized by Rusching et al. in 1969 with the name of carticaine, and was first marketed in Germany in 1976. By 1983 the drug was available in practically all of Europe and Canada, though it was not approved in the United States until March 2000, and only in its presentation as a 4% solution with epinephrine 1:100,000 [6]. The pharmacological characteristics of this anesthetic are responsible for its main advantages with respect to other local anesthetics, and include substitution of the aromatic ring with a thiophenic ring that increases the liposolubility of the drug as well as its potency (1.5 times greater than that of lidocaine). Moreover, articaine is the only amide local anesthetic containing an ester group in its molecular structure – thus allowing metabolization of the drug both by plasma esterases and by liver microsomal enzymes (7). The clinical advantages of articaine include the duration of its anesthetic effect – only surpassed by ultra-long acting anesthetics such as bupivacaine, ethidocaine and ropivacaine – and its superior diffusion through bony tissue [8,9].

## MATERIALS

Materials used in this study were all available and were officially supplied by the Department of Oral and Maxillofacial Surgery to perform the study. These included the following:

### Surgical instruments and equipments: (Figure 1)

- Diagnostic instruments: dental mirror, dental probe, and dental tweezers.
- Local anesthesia instruments: dental syringe, dental needle, dental cartridge (articaine 4% with 1:80000 adrenalin).
- Flap making instruments: scalpel handle, blade number 15, periosteal elevator, and flap retractor
- Disposable, hypodermal syringe, disposable cup, 0.2% chlorhexidine solution, gloves, cotton, gauze, mask and gown.
- Bone removal instruments: straight surgical handpiece (W.O.H) and surgical burs (1/2 rose head round bur)
- Tooth division and delivery instruments: elevators and chisels
- Suturing instruments: needle holder, scissor and 3/0 black silk suture.

### Medications

- Ibo profen tab 400 mg on need. (julphar.U.A.E)

- Amoxicillin cap 500 mg 1\*3 for 5 days.(S.D.I. IRAQ)
- Metronidazole tab 500 mg 1\*2 for 5 days.(M.O.H. IRAQ)

### Other equipments

- Electrocardiogram (Monitor) (OMNIA U.S.A) (Figure 2).
- Electrical pulp tester (Figure 2).
- Timer.

The study focus on performing surgical extraction of impacted lower third molar for 30 patients by using 1.8 ml cartridges of 4% articaine with epinephrine 1:80 000. A standardized surgical procedure was performed on all patients by the same right-handed operator in the same operating room and under similar conditions.. A standard inferior alveolar and long buccal nerve block was given using 2 cartridges of 4% articaine with epinephrine 1:80 000 .Surgical access routinely achieved buccally through a triangular full thickness flap beginning from retromolar pad area advancing anteriorly to the distal aspect of the mandibular second molar with releasing incision on the disto-buccal aspect of the second molar (Figure 3). After flap reflection, bone cutting was performed with a straight hand-piece using a round bur under continuous irrigation with a diluted chlorhexidine solution (0.2%) (Figures 4,5). Sectioning of the crown or roots was performed when necessary by a fissure bur. Then we do suturing of the flap by two simple interrupted stiches using a 3-0 silk suture (fig.6). Pain was evaluated using a visual analogue scale (VAS) (10) 10 cm in length, ranging from 0 "no pain" to 10 "the worst possible pain". During surgery, by using the Electrocardiograph (monitor) we measure the blood pressure (systolic and diastolic), heart rate and mean arterial pressure (MAP) all these by wrapping the pressure cuff around patient's left arm before surgery ,during injection of the local anesthetic solution, after 5 minutes of injection, during surgery and finally 10 minutes after suturing. Patients were also instructed to report the number of rescue analgesic tablets required on the day of surgery (till 24 hours post operatively) and what is the time of the first analgesic tab taken.

### Statistical analyses

Data were incrementally entered over the course of study into an electronic sheet (Excel, Microsoft inc, Windows 2010) and then processed using the Statistical Package for Social Sciences (SPSS) software (version 12.0, SPSS Inc., USA).

## RESULTS

### Pain measurements during surgery

Articaine local anesthetic shows significant reduction in the magnitude of pain mostly during surgery in which articaine presented very potent local anesthetic and the patients who received articaine local anesthetic feel no pain during surgery (table 1).



### Effects on cardiovascular system

Articaine local anesthetic shows no effects on systolic pressure while other local anesthetics raise the systolic pressure during injection (Table 2).

### Swelling, pain after surgery, and trismus measurements

Pain (on VAS) also reached its peak on day 1 and faded away by day 7. The latter effect was reflected on the number of rescue analgesic tablets taken at each interval, which showed significantly higher counts on day 1 after

surgery. There was significant reduction of pain in which the patient who received articaine local anesthetic presented with less amount of pain when compared with others.

Trismus, on the other hand, was significantly increased at the first 24 hours postoperatively which means no effects of articaine on the amount of trismus. Swelling was most severe on postoperative day 1 and decreased gradually through the subsequent evaluation points to reach approximately preoperative measures by the day 7.

**Figure 1. Impacted teeth Surgical instruments**



**Figure 2. (A) Electrocardiograph (monitor), (B) electrical pulp tester**



**(A)**



**(B)**

**Figure 3. Initial triangular incision**



**Figure 4. Flap reflection**



**Figure 5. Bone removal and tooth exposure**



**Figure 6. Wound closure and suturing**



**Table 1. Onset of action and pain during surgery measurements**

variable	Articaine
Numbness After(minutes)	2.3(1.5)
Pin prick After(minutes)	4.37(2.1)
Pulp test After(minutes)	4(1.6)
Pain during Procedure	0.37(0.99)
Time of 1 <sup>st</sup> tab	77.5(26.8)

**Table 2. The effects of articaine local anesthetic on the cardiovascular system during surgery**

variable	Articaine
<b>Systolic pressure</b>	
Base line	127.75(10.65)
During injection	127.25(7.36)
After 5 minutes	131.12(13.48)
During sugery	132.62(12.16)
Ten minutes after Suturing	129.5(13.82)
<b>Diastolic pressure</b>	
Base line	77.62(10.69)
During injection	79.75(10.84)
After 5 minutes	78.87(14.46)
During sugery	81.62(9.55)
Ten minutes after Suturing	82.37(10.67)
<b>Heart rate</b>	
Base line	80.62(10.87)
During injection	96.37(16.31)
After 5 minutes	93.37(14.56)
During sugery	86.75(9.67)
Ten minutes after Suturing	85.12(11.62)
<b>MAP</b>	
Base line	95.35(11.59)
During injection	100(6.98)
After 5 minutes	97.25(14.96)
During sugery	99.12(11.98)
Ten minutes after Suturing	95.37(15.64)

**DISCUSSION**

The main finding in the present prospective study was that articaine local anesthetic has strong analgesic efficacy (table1). In addition the onset (numbness) of articaine was rapid. The potency of local anesthetics increases parallel with increasing lipid solubility. The binding ability of articaine anesthetics to the phospholipid membrane as a result of physicochemical features and in vivo interaction has also been found to be directly in parallel with the potency [11]. Articaine contains a thiophene ring instead of benzene like lidocaine This gives the molecule better diffusion properties compared with lidocaine [12]. Articaine local anesthetic which nearly has no effects on blood pressure during injection Articaine, like most local anesthetics at concentrations that are used clinically, has a vasodilatory effect, increasing its systemic absorption so this in turn will reduce the systolic pressure which is a reactionary pressure that is already increased by patient tension and fear from surgery so that the net result is no changes in systolic pressure.

**COMPLICATIONS**

No cases of alveolar osteitis developed in any of study groups. The triangular flap used and placement of 2 stiches for suturing may be a factor behind the reduced incidence of this complication and the routine use of antibiotics in the present study may explain the absence of any case of infection.

**CONCLUSIONS**

- Articaine in 4% solution with 1:80,000 epinephrine showed a significant reduction of pain and rapid onset of action for patients who have undertaken lower third molar surgery and the patient feels no pain during surgery, with a little or no effects on the cardiovascular system
- Articaine can be recommended as safe alternative anesthetic to lidocaine local anesthetic in third molar surgery.



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