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Original Research

Comparative evaluation of articaine and bupivacaine in impacted mandibular third molar tooth surgery

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ABSTRACT:

Background: Local anesthesia and pain management are the most important tenets in any oral surgical procedure. [7]The present study compared articaine and bupivacaine in impacted mandibular third molar tooth surgery. **Materials & Methods:** 64 subjects scheduled for surgical extraction of impacted lower third molar were divided into 2 groups of 32 each was done. Group I received articaine (4% articaine with 1:100,000 epinephrine) and group II received bupivacaine (0.5% bupivacaine with 1:200,000 epinephrine). Parameters such as postoperative pain intensity at 6, 12, 24, 48, 72 hours and 7th day using a horizontal 100-mm visual analog scale (VAS) was used. **Results:** Group I had 18 males and 14 females and group II had 16 males and 16 females. Onset of action was 42.7 seconds in group I and 61.3 seconds in group II. Duration of surgery was 128.4 minutes in group I and 276.2 minutes in group II. Time of first rescue analgesic medication was 132.6 minutes in group I and 286.4 minutes in group II. Difficulty of surgery was 3.36 in group I and 3.31 in group II, total amount (ml) was 2.28ml in group I and 2.86 ml in group II, intra- operative comfort was 1.12 in group I and 1.52 in group II and intra-operative bleeding was 1.22 in group I and 1.40 in group II. The mean VAS at 6 hours was 3.69 in group I and 2.19 in group II, 12 hours was 1.39 in group I and 1.70, 24 hours was 0.67 in group I and 1.21 in group II, 48 hours was 0.97 in group I and 0.40 in group II, 72 hours was 0.78 in group I and 1.24 in group II and 7th day was 0.65 in group I and 0.69 in group II. **Conclusion:** Articaine showed greater clinical efficacy than bupivacaine in intraoperative anesthesia and achieving faster onset of anesthetic action.

Key words: Articaine, bupivacaine, mandibular third molar

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INTRODUCTION

Postoperative pain is induced by intraoperative trauma and the release of chemical mediators, such as histamine, serotonin, quinine, and arachidonic acid.[1] In postoperative pain control, the combination of short-acting local anesthetics and nonsteroidal anti-inflammatory drugs (NSAIDs) is used frequently; however, the application of long-acting local anesthetics is also effective in managing postoperative pain.[2]

Local anesthesia and pain management are the most important tenets in any oral surgical procedure. Patient compliance and effective surgical procedure mandates complete pain control in order to gain patient cooperation and manage patient anxiety.[3] Pain perception depends upon the patient's pain threshold and quality of local anesthetics (LAs) used. LAs are believed to be the most frequently used drugs in clinical dentistry. It has been estimated that >300 million cartridges of LA are administered annually by dentists in the United States.[4]

Bupivacaine has an intermediate speed of onset and relatively long latency time, with a pk value of 8.11, while its high liposolubility reduces its effectiveness in infiltrative techniques because a large amount is retained by soft tissues and only a small volume reaches the bone.[5] It is mainly indicated for procedures of long duration and postoperative pain management. For its part, articaine is an amide-type local anaesthetic widely used in oral surgery due to its rapid action, potency, and intermediate duration.[6] Authors have compared the analgesic efficacy of bupivacaine with that of other local anaesthetics in the extraction of impacted third molars, but few compared

it with the analgesic efficacy of articaine after surgery in the maxillofacial area, and the results were largely inconclusive.[7]The present study compared articaine and bupivacaine in impacted mandibular third molar tooth surgery.

MATERIALS & METHODS

The present study comprised of 64 subjects scheduled for surgical extraction of impacted lower third molar. They were agreed to participate in the study.

Demographic data of each subject was recorded. Randomization into 2 groups of 32 each was done. Group I received articaine (4% articaine with 1:100,000 epinephrine) and group II received bupivacaine (0.5% bupivacaine with 1:200,000 epinephrine). Parameters such as postoperative pain intensity at 6, 12, 24, 48, 72 hours and 7th day using a horizontal 100-mm visual analog scale (VAS) was used. The need for rescue analgesia, the quality of intraoperative anesthesia etc. was recorded. Quality of anesthesia was assessed using a three-point category rating scale and intraoperative bleeding was rated using a 3-point category rating scale. A modified Parant scale was used to determine the difficulty of the surgery. The total amount of local anesthetic solution and the presence of any side effects during the operation were also recorded. Patients returned 7 days after the surgery for a postoperative follow-up and suture removal. Results were tabulated and assessed statistically. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Agent	4% articaine with 1:100,000 epinephrine	0.5% bupivacaine with 1:200,000 epinephrine
M:F	18:14	16:16

Table I shows that group I had 18 males and 14 females and group II had 16 males and 16 females.

Table II Comparison of parameters

Parameters	Group I	Group II	P value
Onset of action (s)	42.7	61.3	0.01
Duration (min)	128.4	276.2	0.02
Time of first rescue analgesic medication (min)	132.6	286.4	0.05
Difficulty of surgery	3.36	3.31	0.91
Total amount (ml)	2.28	2.86	0.04
Intra- operative comfort	1.12	1.52	0.03
Intra- operative bleeding	1.22	1.40	0.90

Table II, graph I shows that onset of action was 42.7 seconds in group I and 61.3 seconds in group II. Duration of surgery was 128.4 minutes in group I and 276.2 minutes in group II. Time of first rescue analgesic medication was 132.6 minutes in group I and 286.4 minutes in group II. Difficulty of surgery was 3.36 in group I and 3.31 in group II, total amount (ml) was 2.28ml in group I and 2.86 ml in group II, intra- operative comfort was 1.12 in group I and 1.52 in group II and intra- operative bleeding was 1.22 in group I and 1.40 in group II. The difference was significant (P< 0.05).

Graph I Comparison of parameters

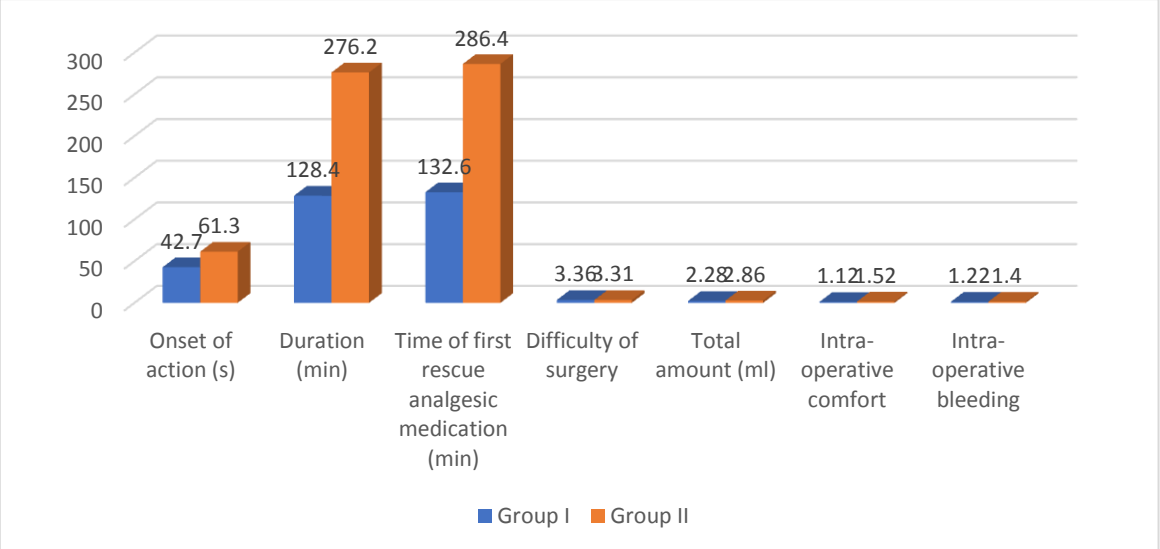
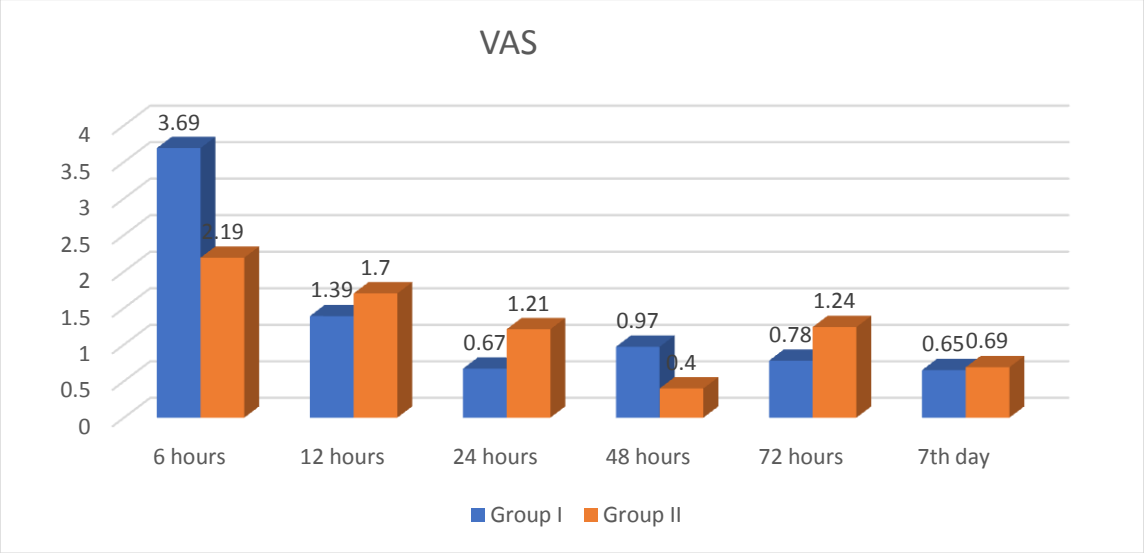


Table III Comparison of pain (VAS)

Duration	Group I	Group II	P value
6 hours	3.69	2.19	0.01
12 hours	1.39	1.70	0.91
24 hours	0.67	1.21	0.80
48 hours	0.97	0.40	0.02
72 hours	0.78	1.24	0.11
7th day	0.65	0.69	0.98

Table III, graph II shows that mean VAS at 6 hours was 3.69 in group I and 2.19 in group II, 12 hours was 1.39 in group I and 1.70, 24 hours was 0.67 in group I and 1.21 in group II, 48 hours was 0.97 in group I and 0.40 in group II, 72 hours was 0.78 in group I and 1.24 in group II and 7th day was 0.65 in group I and 0.69 in group II. The difference was non- significant (P> 0.05).

Graph II Comparison of pain (VAS)



DISCUSSION

LAs are chemicals that block nerve conduction in a specific, temporary, and reversible manner, without affecting the patient's consciousness. The molecule consists of two poles: a hydrophilic tertiary or secondary amino group, and a lipophilic aromatic ring.[8,9] According to the type of intermediate alkyl linkage between them, they are classified under ester-type anesthetics, with an amino-ester bond and whose prototype is procaine, and the amide-type with an amino-amide bond and whose prototype is lidocaine.[10] Various LA agents have been studied and reported in the literature, but, because of the long latency period of procaine and allergies to ester anesthetics, lidocaine after its synthesis in 1943 by Nils Lofgren quickly became the gold standard because of its minimal side effects and effective pain control.[11] Articaine and bupivacaine are effective and comparable to lidocaine. Articaine a safe anesthetic with a fast onset and an adequate duration with few side effects.[12] Bupivacaine is often chosen for prolonged postoperative pain control and analgesia in extended operations. Moreover, some authors have attributed its ability to attain longer postoperative analgesic periods, reducing analgesic requirements in the early postoperative hours when the maximum pain intensity is reached.[13,14] The present study compared articaine and bupivacaine in impacted mandibular third molar tooth surgery.

In present study, we found that group I had 18 males and 14 females and group II had 16 males and 16 females. Tokuc et al[15] assessed the anesthetic, analgesic, and hemodynamic effects of articaine and bupivacaine in the extraction of impacted mandibular third molar teeth. Twenty-six patients who underwent removal of bilaterally symmetric mandibular third molars were randomly assigned to articaine and bupivacaine groups in a split-mouth design. The onset of anesthetic action, intraoperative comfort, total amount of solution used, duration of postoperative anesthesia and analgesia, rescue analgesic use, postoperative pain, intraoperative bleeding, and hemodynamic parameters were evaluated. In the articaine group, the onset of anesthetic activity was faster, intraoperative comfort was greater, and effective anesthesia required less local anesthetic solution. The bupivacaine group showed a significantly longer duration of postoperative anesthesia and analgesia, in addition to lower visual analog scale values at 6 and 48 hours postoperatively. There were no significant differences between the two solutions regarding rescue analgesic medication use, intraoperative bleeding, or hemodynamics.

We found that onset of action was 42.7 seconds in group I and 61.3 seconds in group II. Duration of surgery was 128.4 minutes in group I and 276.2 minutes in group II. Time of first rescue analgesic medication was 132.6 minutes in group I and 286.4 minutes in group II. Difficulty of surgery was 3.36 in group I and 3.31 in group II, total amount (ml) was 2.28ml in group I and 2.86 ml in group II, intra-operative comfortwas 1.12 in group I and 1.52 in group II and intra- operative bleeding was 1.22 in group I and 1.40 in group II. Thakare et al[16] in their study 40 systemically healthy patients requiring premolar extraction for orthodontic reasons were included. Patients were categorized into two groups (4% articaine and 0.5% bupivacaine) in a crossover manner (160 premolars). Parameters recorded included: time of anesthetic onset, duration of postoperative analgesia, time to first rescue analgesic medication, and visual analog scale (VAS). At the first appointment, both upper and lower premolars were extracted on one side of the jaws (right or left). A fixed volume of 1.4 mL of 4% articaine or 0.5% bupivacaine (based on a computer-generated list) was infiltrated in the buccal vestibule (local infiltration) for extraction. At the second appointment, after a washout period of 15 days, the anesthetic agent that was not administered at the first appointment was administered in a crossover manner. Each patient was evaluated using a 100-mm VAS during and after extraction. The results showed that 4% articaine had significantly faster onset of action and lower VAS scores when compared with bupivacaine. However, the duration of analgesia and time to first rescue analgesic medication was longer in the bupivacaine group,

We observed that mean VAS at 6 hours was 3.69 in group I and 2.19 in group II, 12 hours was 1.39 in group I and 1.70, 24 hours was 0.67 in group I and 1.21 in group II, 48 hours was 0.97 in group I and 0.40 in group II, 72 hours was 0.78 in group I and 1.24 in group II and 7th day was 0.65 in group I and 0.69 in group II. Ahmed et al[17] in their study 50 volunteers undergoing scheduled surgical extraction of the impacted lower third molar. A computer-generated random sequence was used to allocate participants to the articaine (4%) or bupivacaine (0.5%) group. VAS-measured pain intensity was higher ($p< 0.05$) in the articaine group than in the bupivacaine group at all-time points except for 8 h post-surgery ($p=0.052$). Rescue medication was required by 13 (52%) patients in the articaine group and 8 (32%) patients in the bupivacaine group, although the difference was not statistically significant. The groups did not differ ($p=0.391$) in the quality of the intraoperative anesthesia. Bupivacaine is a valid alternative to articaine in third molar surgery and may offer residual anesthesia as a means of reducing postoperative pain. However, further well-designed RCTs are required in larger study populations to verify the effectiveness of bupivacaine to achieve residual analgesia after oral surgery

CONCLUSION

Authors found that Articaine showed greater clinical efficacy than bupivacaine in intraoperative anesthesia and achieving faster onset of anesthetic action.

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