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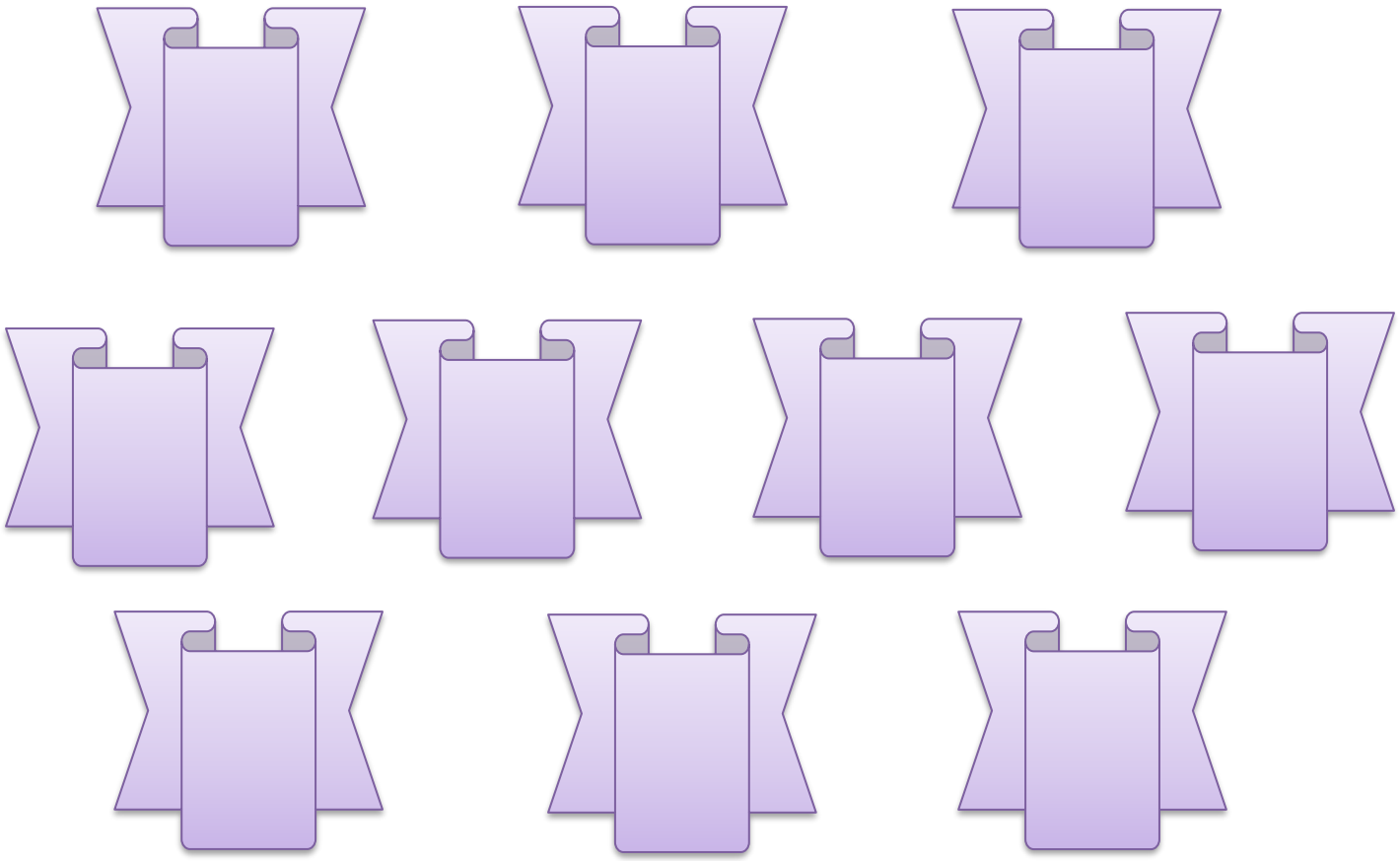

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Original Article

A Comparative Study of The Analgesic Effect of Articaine 2% for Management of Postoperative Pain after Thoracotomy Using Ultrasound-Guided Erector Spinae Plane Block

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ABSTRACT

Background: Articaine has been used as a local anesthetic for dental procedures, but studies about articaine used as a local anesthetic for regional block after thoracic surgeries are limited.

Aim of the Study: Our study compares the postoperative analgesic efficacy of articaine 2% and bupivacaine 0.25% through erector spinae block for after thoracic surgeries.

Patients and Methods: All patients were divided into two groups. Group I [20 patients] [erector spinae block with bupivacine 0.25%] was performed before extubation with an injection of 30 ml of 0.25% bupivacine. Group II [20 patients] [erector spinae block with articaine 2%] was performed before extubation with an injection of 30 ml of articaine 2%.

Results: As regard the visual analogue scale at 8 h and 12 h, postoperatively, there was significant variance among the 2 groups [p value=0.045, p value=0.002]. Also, with regard to first-rescue analgesia and the total dose of morphine, there was significant variance among the 2 groups [p value=0.006, p value=0.02].

Conclusion: Articaine is a reliable local anesthetic agent when compared to bupivacaine for regional block after thoracic surgeries.

Keywords: Articaine; Bupivacaine; Postoperative pain; Thoracic surgeries

INTRODUCTION

Regional anesthesia has been considered a method for efficient control of pain after surgery. Regional blocks utilizing ultrasound have become a good complement to general anesthesia to provide perfect analgesia after the surgery [1, 2]. Postoperative pain can lead to pneumonia, atelectasis, respiratory failure, and impaired patient recovery. The pain after thoracotomy operations is considered a semblance of intolerable pain that can be ascribed to muscle splitting, rib retraction, and injury to the intercostal nerves. Inappropriate control of this intolerable pain can lead to a lack of respiratory function, a lack of ventilation, an ineffectual cough, and a rising incidence of infection [3-5].

The advantages of regional anesthesia include good postoperative analgesia, decreased analgesic demand, improved ambulatory discharge and decreased hospital stay [6]. The control of this intolerable pain after thoracotomy operations can be done by utilizing many methods including intravenous analgesia, thoracic epidural, para-vertebral nerve block, and the erector spinae plane block [ESP] [7-9].

ESPB is defined as the installation of local anesthetics among the transverse process and erector spine muscle. ESPB performance on the sympathetic nerves and unilateral somatic control of intolerable pain after thoracic surgeries, breast surgeries, and renal surgeries [10, 11].

Articaine is considered effective as a local anesthetic as lidocaine, but it shows the best cardiac stability. Articaine has a faster onset and prolonged duration when compared to lidocaine [12, 13]. Articaine provides further efficient anesthesia when adrenaline is added to it [14, 15].

Our study assessed the postoperative analgesic efficiency of articaine 2% and bupivacaine 0.25% through erector spinae block for after thoracic surgeries.

PATIENTS AND METHODS

This random, double-blind, comparative study was done after procuring agreement from the Ethics Committee of the hospital and written informed consent from forty patients at Benha university from March 2020 to June 2022 who were planned for thoracotomies with general anesthesia. The inclusion criteria were agreeing to receive regional nerve block, ASA Physical Status I, II or III, age 18 - 70 years and BMI between 15 kg /m^2 - 35 kg/m^2. The exclusion criteria included patient refusal, infection at the site of block, bleeding diathesis, allergy to local anesthetic, being unable to communicate with investigators, significant cardiac, neurological, hepatic, and renal diseases, and BMI greater than 35 kg/m^2.

Recruitment of the study participants

Patients were randomly assigned to one of two groups using sealed envelopes presented by a blinded assistant, and the block was performed by an anesthesiologist [who specialized in this block]. Group I [20 patients] [erector spinae block with bupivacine 0.25%] performed before extubation with an injection of 30 ml of 0.25% bupivacine. Group II [20 patients] [erector spinae block with articaine 2%] performed before extubation with an injection of 30 ml of articaine 2%.

When incoming to the theater of operations, patients were connected to monitors for non-invasive arterial blood pressure, pulse oximetry, and electrocardiogram. Patients will be edified how to self-detect severity of pain by the visual analogue scale [VAS, 10 points scale where 0 = no pain and 10 = intolerable pain] [13]. General anesthesia was started with propofol 2 mg/kg, fentanyl 1 µg/kg, and cisatracurium 0.5 mg/kg, and tracheal intubation was done in both groups. The studied technique was done after the end of surgery and just before extubation.

Technique: ESPB was done with ultrasound guidance while the patients were in the lateral recumbency position with the side of surgery superior. After skin antisepsis, the needle insertion area was covered with a sterile coat. The ultrasound probe was put on the lateral side of the posterior median line to determine the transverse process and erector spine muscle. Once the erector spinae muscle and the transverse processes had been detected, a 22 G 90-mm spinal needle was introduced in a caudad-to-cephalad direction by using a sterile probe cover until the tip was put in the interfacial plane deep into the erector spinae muscle. When the needle was in the correct position, which was confirmed by hydro-dissection, 30 ml of local anesthetic was injected into the interfascial plane on top of the transverse process and beneath the erector spinae muscle.

Outcome measures: The primary outcome is the detection of the visual analogue scale [the degree of postoperative assessment at 4, 8, 12, 16, 20, and 24 hours].

Secondary outcome: The secondary outcome also includes analgesic consumption in the first 24 h [morphine was managed by means of a patient-controlled analgesia [PCA] pump for 24 hours. The secondary outcomes also included adverse events [hypotension, bradycardia, nausea, and vomiting] and any complications related to block.

Sample size: The sample size was counted according to a previous study [16]. This study estimates the variance in pain scores for 24 h among the two groups with a standard deviation of 4.6 and an alpha error. So, we needed 20 patients per group

Statistical analysis: Analysis the data was carried out using SPSS. Quantitative data were displayed as mean and SD and were construed by using a one-way analysis of different tests. Qualitative data were presented as numbers and percentages. They were interpreted using the 2 and Fisher exact tests, with a P-value of less than 0.05 considered significant.

RESULTS

A total of fifty-two patients were showed through the period of our study. Twelve patients did not meet with the inclusion criteria. A total of 40 patients were included in this study [fig 1].

Regarding age, weight, height, surgical duration, and ASA, there was no significant statistical variance among the 2 groups [table 1].

Table [2] showed no significant variance among the 2 groups, related to HR for the first 24 h.

Table [3] showed no significant variance among the 2 groups, related to mean arterial pressure for the first 24 h.

Table [4] showed significant variance among the 2 groups related to VAS, postoperatively, at 8 h, and at 12 h.

There is significant variance among the 2 groups as regards first rescue analgesia and the total dose of morphine [table 5]

Table [6] showed no significant variance the 2 groups, related to the incidence of nausea and vomiting [p-value > 0.05].

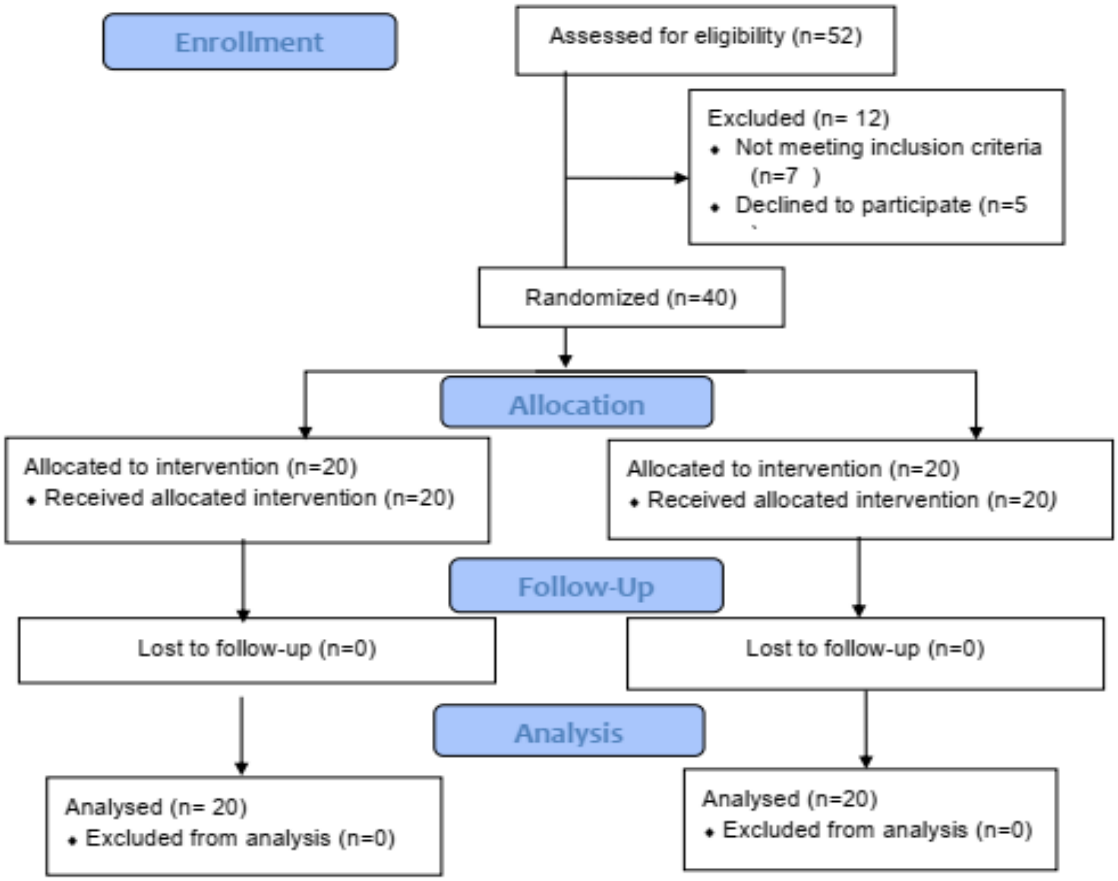

Figure [1]: Consort flow chart

Table [1]: Demographic information for the two groups

		Group I [n=20]	Group II [n=20]	P value
Age [yrs.]		44.38 ±5.93	46.41 ± 6.54	0.237
Weight [kg]		74.23 ± 9.23	76.34 ± 8.38	0.401
ASA	I II III	5 12 3	4 14 2	0.43
Height [cm]		166.12 ± 6.89	168.45 ± 7.54	0.259
Duration of surgery [min.]		92.43 ± 11.56	53.74 ± 12.45	0.705

Table [2]: Heart rate for the two groups

Heart Rate	Group I [n=20]	Group II [n=20]	P Value
At PACU	79± 7	78± 6	0.667
After 4 h	74± 4	76± 2	0.766
After 8 h	76± 3	75± 7	0.567
After 12 h	76± 3	74± 4	0.867
After 16 h	74± 7	75± 6	0.845
After 20 h	78± 7	77± 8	0.877
After 24 h	79± 6	78± 5	0.757

PACU: Post-anesthetic care unit

Table [3]: Mean arterial pressure [MAP] for the two groups

Mean arterial pressure	Group I [n=20]	Group II [n=20]	P Value
At PACU	74 ± 8	76 ± 7	0.847
After 4 h	76 ± 6	78 ± 4	0.868
After 8 h	78 ± 4	76 ± 6	0.865
After 12 h	76 ± 3	74 ± 4	0.667
After 16 h	74 ± 6	76 ± 7	0.967
After 20 h	78 ± 8	76 ± 7	0.857
After 24 h	73 ± 6	74 ± 4	0.768

PACU: Post-anesthetic care unit

Table [4]: Visual analogue score for the two groups

VAS	Group I [n=20]	Group II [n=20]	P value
At PACU	1 [0-4]	0 [0-4]	0.321
At 4 h	1 [0-4]	1 [0-3]	0.768
At 8 h	2 [0-4]	3 [0-5]	**0.045***
At 12 h	2 [0-4]	3 [1-6]	**0.002***
At 16 h	3 [0-6]	4 [0-6]	0.587
At 20 h	3 [0-6]	4 [1-6]	0.469
At 24 h	3 [1-6]	4 [1-6]	0.419

PACU: Post-anesthetic care unit; *: significant

Table [5]: Pain rescue-analgesia consumption in the first 24 h in both groups

	Group I [n=20]	Group II [n=20]	P Value
Time of first rescue dose [hours]	15 ± 3	7 ± 4	**0.006***
Total dose of morphine [mg]	6 ± 2	9 ± 2	**0.02***

*: significant

Table [6]: Postoperative complications

	Group I [n=20]	Group II [n=20]	P Value
Nausea	3 [15%]	2 [10%]	0.548
Vomiting	1 [5%]	1 [5%]	1.000

DISCUSSION

Severe pain after surgery, especially after thoracotomy, may lead to pulmonary complications and affect recovery [17]. Also, the use of opioids and muscle relaxants during the perioperative period may lead to more deterioration of respiratory function, especially during the post-operative period [18, 19].

For that reason, a regional block technique was very important for post-operative analgesia especially after thoracotomy [20, 21].

ESP block is an interfacial block, and simple to perform. ESP block was effective for decreasing the Visual Analogue Scores and improving the quality of recovery [21]. ESP block was effective for deceasing opioid consumption and lowering the incidence of itching, nausea, and vomiting [23, 24].

In our study, we compared erector spinae plane block with 0.25% bupivacaine versus erector spinae plane block with 2% articaine, performed before extubation. Regarding demographic data [age, weight, height, surgical duration, and ASA], there was no statistically significant variance between the two groups. Also, there was no statistically significant variance between the two groups in terms of mean arterial pressure and heart rate throughout the first 24 hours. Additionally, there was no statistically significant variance between the two groups related to the incidence of postoperative complications [nausea and vomiting]. However, regarding the visual analogue scale at 8 h and 12 h postoperatively, there was a statistically significant variance between the two groups [p value=0.045, p value=0.002]. Also, with regards to first rescue analgesia and total morphine dose, there was a statistically significant variance between the two groups [p value = 0.006, p value=0.02].

Articaine has been studied for Ophthalmic surgeries because it spreads through tissues more easily than other local anesthetic agents. Articaine has been studied for septoplasty surgery with a decreasing incidence of pain and decreasing incidence of complications [25, 26]. Also, dermatologists have been using articaine for infiltrative anesthesia in cutaneous surgeries [27, 28]. Also, there have been many studies investigating articaine versus bupivacaine as a spinal blockade. Also, there was a study on using articaine in cervical epidural anesthesia for hand surgeries [29, 30]. Multiple studies have investigated articaine versus bupivacaine for dental surgeries [31].

Our study agrees with a study done by **Eldemrdash and Abdelzaam** [9], in which they showed the effects of articaine 2% with adrenaline during erector spinae plane block for assessment of postoperative analgesia after radical mastectomy. Also, our study agrees with a study done by **Armanious and Abdelhameed** [32], in which they showed the effects of articaine 2% versus bupivacaine for ultrasound-guided supraclavicular brachial plexus block. That study concluded that articaine is an efficacious and reliable alternative to bupivacaine.

Limitation of the study: There is a lack of studies about articaine use in ultrasound-guided erector spinae plane block as a regional block after thoracic surgeries.

Conclusion: Articaine is a reliable local anesthetic agent when compared to bupivacaine for regional block after thoracic surgeries.

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