Submitted: 02 October, 2021 Accepted: 25 November, 2021 Published: 08 March, 2022 DOI:10.22514/sv.2022.004

Open Access
Signa Vitae

ORIGINAL RESEARCH

Postoperative analgesic efficacy of the thoracoabdominal nerves block through perichondrial approach (TAPA) and modified-TAPA for laparoscopic cholecystectomy: a randomized controlled study

Tuna ERTÜRK[1,*], Ayşın ERSOY[1]

[1]Department of Anesthesiology, University of Health Sciences, Sultan 2. Abdulhamid Han Training and Research Hospital, 34668 Istanbul, Turkey

***Correspondence**
tunaerturk22@yahoo.com
(Tuna ERTÜRK)

Abstract

Laparoscopic cholecystectomy is one of the most common surgical procedures. Even though there is less postoperative pain with laparoscopic cholecystectomy than with open cholecystectomy, severe pain can occur, particularly within the first 24 hours. Evaluation of the efficacy of ultrasound-guided interfascial plane blocks for postoperative analgesia of laparoscopic cholecystectomy has recently come to prominence. The aim of our study was to compare the postoperative analgesic efficacy of thoracoabdominal nerves block through perichondrial approach (TAPA) and modified-TAPA (m-TAPA) blocks in patients who underwent laparoscopic cholecystectomy. The present study included 56 patients who underwent laparoscopic cholecystectomy under general anesthesia and received TAPA or m-TAPA block for perioperative analgesia. Each patient signed a written informed consent form. Block times and numerical rating scale (NRS) scores 1, 2, 3, and 12 hours postoperatively, hourly and total tramadol amount of use via the patient-controlled analgesia device, and additional analgesic drug consumption were all recorded. The TAPA group had significantly longer block application times than the m-TAPA group. At 1 and 12 hours, NRS scores were lower in the TAPA group. However, the mean NRS scores, total tramadol use, and use of additional analgesics were comparable between the groups. TAPA and m-TAPA block methods reduced NRS scores by alleviating pain after laparoscopic cholecystectomy procedures, thereby reducing the need for additional analgesics. Block times for TAPA were significantly longer than those for m-TAPA. However, both block applications were completed in a short period, smoothly and safely. The analgesic effect of TAPA block was more distinctive at 1 and 12 hours, and NRS scores were lower. However, we think that both block methods, when used under ultrasound guidance, will provide effective analgesia by supplementing the multimodal analgesia planned for laparoscopic cholecystectomy and other abdominal operations.

Keywords

Laparoscopic cholecystectomy; TAPA block; m-TAPA block; Postoperative pain

1. Background

Laparoscopic cholecystectomy is one of the most frequently performed procedures and has a short postoperative hospital stay [1]. Even though laparoscopic cholecystectomy results in less postoperative pain than open cholecystectomy, severe pain is a common complaint, particularly in the first 24 hours [2]. Pain following laparoscopic cholecystectomy has both somatic and visceral components, and various treatment methods have been tried to alleviate postoperative pain [3].

Many methods have been used to treat postoperative pain after laparoscopic cholecystectomy, including patient-controlled thoracic epidural analgesia, intravenous patient-controlled analgesia, intraperitoneal local anesthetic injection, nonsteroidal anti-inflammatory drugs, opioids, and multimodal analgesia [4]. Due to the application difficulties and/or side effects of these treatment methods, the effectiveness of ultrasound-guided interfascial plane blocks has recently come to the fore in the field of regional anesthesia and pain management. Truncal peripheral nerve blocks such as transversus abdominis plane block, quadratus lumborum block, and serratus intercostal plane block performed under ultrasound guidance are used in major abdominal operations as part of multimodal analgesia, but many of them might be insufficient in surgical fields in terms of sensory block distribution. While transversus abdominis plane block

provides effective analgesia in the midabdominal region, it is generally insufficient for lateral abdominal sensory blockade. The opposite is true for serratus intercostal plane block [5].

Thoracoabdominal nerves block through perichondrial approach (TAPA) and then modified-TAPA (m-TAPA) block, a modification of this block, have recently been described. It has been reported that TAPA block provides sensory block between the midaxillary line and the midabdominal/sternum in T5–T12 dermatomes, whereas m-TAPA block provides sensory block between the midaxillary line and the midabdominal/sternum in T8–T12 dermatomes [6, 7]. In TAPA block, local anesthetic is applied to two points, the upper aspect of the chondrium and the lower aspect of the chondrium. In this way, anterior and lateral cutaneous branches of the intercostal nerves are blocked. It is thought that the efficacy of m-TAPA block against lateral cutaneous branches of the intercostal nerves is low. In the light of this information, we think that the analgesic efficacy will be higher and the effect will be faster in TAPA block.

The aim of our study was to compare the postoperative analgesic efficacy of unilateral TAPA and m-TAPA blocks used in patients undergoing laparoscopic cholecystectomy.

2. Materials and methods

The study group consisted of patients aged between 18 and 90 years and classified as I–II–III by the American Society of Anesthesiologists (ASA). Patients aged younger than 18 years, older than 90 years, with ASA physical status classification IV, with infection of the skin at the site of the needle puncture area, with known allergies to any of the study drugs, receiving antithrombotic therapy, and with abnormal coagulation parameters were excluded from the study.

The patients were informed about the block method (TAPA or m-TAPA) to be applied while in the premedication room. Their demographic data were recorded. All patients were premedicated with 0.03 mg kg^{-1} midazolam 15 minutes before being taken into the operating room. Intravenous propofol 2 mg kg^{-1}, rocuronium 0.5 mg kg^{-1}, and fentanyl 1 μg kg^{-1} were used for the induction of anesthesia. Anesthesia was maintained with 2 MAC sevoflurane in a mixture of 50% oxygen + 50% air.

Patients in the study were divided into two groups, each with 28 patients: those who received TAPA block (TAPA group) or those who received m-TAPA block (m-TAPA group) and randomized using the "https://www.randomizer.org/#randomize" program.

After the induction of anesthesia, the block was applied before the surgical procedure was started. After surgical skin disinfection with 10% povidone-iodine, it was covered with sterile surgical fenestrated drapes and the US probe was used with a sterile cover (PN:610-043, Ultrasound Probe Covers, CIVCO, Iowa, USA).

TAPA and m-TAPA blocks were administered by a single experienced anesthesiologist (T.E.), who was also in charge of regional anesthesia. Actions such as data collection and processing, statistical analysis, and interpretation were also conducted by the anesthetist (T.E.) who performed the blocking. The patients were followed up by the operating room anesthesiologist, who was not present during the block operation and had no idea which group the patient belonged to.

m-TAPA Block: Under USG (FUJIFILM SonoSite, Inc. 21919 30th Drive SE Bothell, WA 98021 USA) guidance, with an 80-mm insulated peripheral block needle (Stimuplex®, A100, B Braun, Melsungen, Germany), 20 mL of 0.25 percent bupivacaine was injected between the upper fascia of the transversus abdominis muscle and the lower fascia of the costochondral tissue in the midclavicular line, at the level of the 9th and 10th ribs (arcus costarum). It was carried out by following the trace of the block needle in the plane (Fig. 1).

TAPA Block: Under USG (FUJIFILM SonoSite, Inc. 21919 30th Drive SE Bothell, WA 98021 USA) guidance, with an 80-mm insulated peripheral block needle (Stimuplex®, A100, B Braun, Melsungen, Germany), 20 mL of 0.25 percent bupivacaine was injected between the upper fascia of the transversus abdominis muscle and the lower fascia of the costochondral tissue in the midclavicular line, at the level of the 9th and 10th ribs (arcus costarum). Then 15 mL of 0.25 percent bupivacaine was injected into the upper fascia of the costochondral tissue and the lower fascia of the external oblique muscle. It was carried out by following the trace of the block needle in the plane (Fig. 1).

Performance times of the blocks were recorded. The block performance time is the period from inserting the needle to the point when the entire local anesthetic has already been injected (Table 1). At the end of the surgery, all of the patients received paracetamol 1 g IV and dexketoprofen 50 mg as a standard for postoperative analgesia. Ondansetron (8 mg IM) was also administered to all patients to prevent postoperative nausea and vomiting.

At the end of the surgery, an intravenous patient-controlled analgesia (PCA) device (500 mg of tramadol in 100 mL of saline, 20 mg bolus dose, 30 min lockout interval) was prepared. The PCA device was attached to the patient before they were awakened. Patients who were awakened at the end of the procedure were transferred to the postoperative recovery unit and the PCA device was turned on.

The Aldrete scoring system is a commonly used scale for determining when people can be safely discharged from the post-anesthesia care unit to either the postsurgical ward. Between 1 and 15 points are given. When the Aldrete score is 12 points or higher, patients can be sent to the ward from the recovery room. We discharged patients with an Aldrete score of 12 to their ward.

A numerical rating scale (NRS) requires the patient to rate their pain on a defined scale, for example, 0–10, where 0 is no pain and 10 is the worst pain imaginable. NRS scores were recorded at 1, 2, 3, and 12 hours postoperatively, as well as total tramadol use via the PCA device and additional analgesic drug use, if necessary. In both groups, patients with NRS scores greater than 3 were given IV paracetamol 1 g and dexketoprofen 50 mg as rescue analgesia.

3. Statistics

Mean, standard deviation, median, minimum, maximum value frequency, and percentage were used for the descriptive statistics. The distribution of variables was evaluated using the

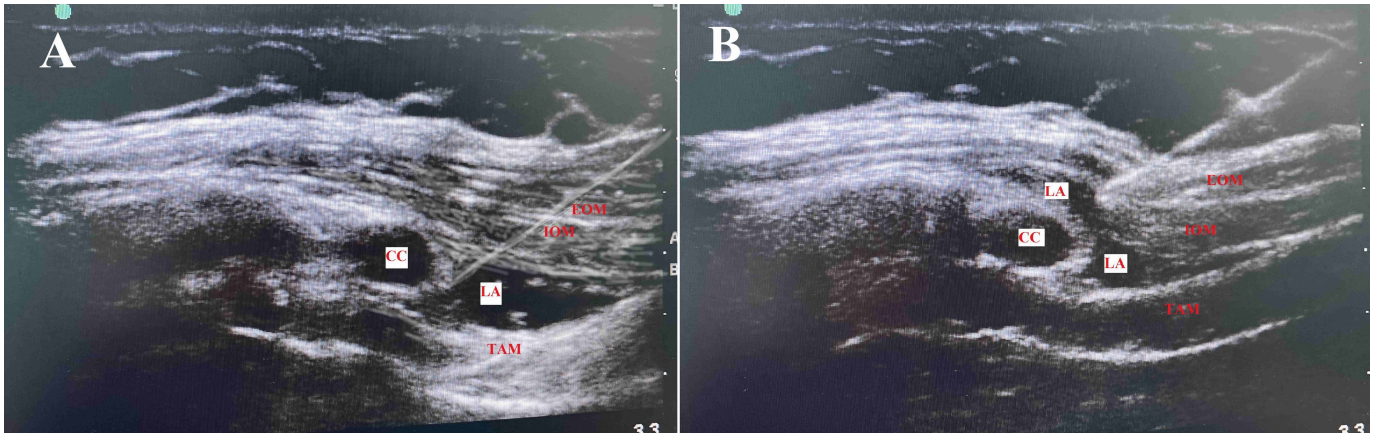

FIGURE 1. Ultrasonographic image of TAPA and m-TAPA blocks. m-TAPA (A) and TAPA (B) ultrasound image of the perichondral region after local anesthetic solution was injected. CC, costal cartilage; EOM, external oblique muscle; IOM, internal oblique muscle; TAM, transversusabdominis muscle; LA, local anesthetic.

Kolmogorov–Smirnov test. The independent samples *t* test and Mann–Whitney U test were used for the comparison of the quantitative data. The chi-square test was used for the comparison of the qualitative data. The statistical analysis was performed with IBM SPSS version 27.0 (SPSS ınc, Istanbul, Turkey).

The power of the study was calculated by referring to the previous study by Khan KK *et al*. [8]. The power analysis was performed for the 80% confidence interval, and the number of patients in each group was determined to be 28, with a total of 56 patients.

4. Results

A total of 56 patients, 34 female and 22 male, participated in the study. During the perioperative period, all of the patients received paracetamol 1 g IV and dexketoprofen trometamol 50 mg as a standard for postoperative analgesia. Only 7 of the 56 patients required analgesics in the postoperative period (paracetamol 1 g and dexketoprofen 50 mg) (Table 2). None of the patients had any complications related to the block application.

The age and sex distributions of the patients in the TAPA and m-TAPA groups did not differ significantly ($p > 0.05$). The distributions of height, weight, BMI, and ASA scores did not differ significantly ($p > 0.05$) between the TAPA and m-TAPA groups either. The duration of block in the TAPA group was significantly ($p < 0.05$) longer than that in the m-TAPA group (Table 1).

There was no significant difference in the 1 hour, 3 hour, 6 hour, 12 hour, or total tramadol use amounts between the TAPA and m-TAPA groups ($p > 0.05$) (Table 1).

The 3 and 6 hour NRS scores did not differ significantly between the TAPA and m-TAPA groups ($p > 0.05$). The 1 hour and 12 hour NRS scores in the TAPA group were significantly ($p < 0.05$) lower than those in the m-TAPA group (Table 1) (Fig. 2).

5. Discussion

The aim of the present study was to compare the postoperative analgesic efficacy of TAPA and m-TAPA blocks administered under ultrasound guidance in patients undergoing laparoscopic cholecystectomy. The mean NRS scores were low in both block methods, as were the amounts of tramadol and additional analgesics used, and adequate analgesia was provided. On the other hand, TAPA block analgesia was significantly more effective at 1 hour and 12 hours. TAPA block times were significantly longer than those of the m-TAPA group.

Even though laparoscopic cholecystectomy is a minimally invasive surgical procedure, there are studies in the literature that link it to chronic pain; therefore, postoperative pain management is critical in this patient population [2, 9, 10]. Even though the pain experienced during laparoscopic surgery is less than that experienced during open laparotomy, multiple trocar entry points (peri- and supraumbilical, as well as midabdominal and lateral abdominal) have been the subject of numerous regional pain studies due to somatic and visceral pain [3, 11, 12].

The effectiveness of ultrasound-guided interfascial plane blocks has recently come to the forefront in the field of regional anesthesia and pain management. The search for a method of regional anesthesia that provides effective analgesia of the anterolateral part of the upper abdomen has always been ongoing. This has been accomplished through the use of anterolateral blocks such as the oblique subcostal transversus abdominis plane block, serratus intercostal plane block, and other posterior blocks such as quadratus lumborum blocks and erector spina plan blocks. While anterolateral block subcostal transversus abdominis plane block provides effective midabdominal analgesia, it is generally insufficient for lateral abdominal sensory blockage; the opposite is true for serratus intercostal plane block, which is sufficient for the lateral abdomen but not the midabdomen. Subcostal transversus abdominis plane block has been proven to block 90% of the midabdominal surface area and 26% of the lateral abdominal surface area, resulting in sensory blockage of T7–T12 dermatomes. Serratus intercostal plane block provides

TABLE 1. NRS scores and amount of analgesic use in TAPA and m-TAPA groups.

	TAPA Group			m-TAPA Group			*p*	
	Mean ± sd/n-%		Median	Mean ± sd/n-%		Median		
Age	48.6 ± 13.1		49	51.2 ± 13.1		51	0.472	t
Sex								
Male	14	50.00%		8	28.60%		0.101	X^2
Female	14	50.00%		20	71.40%			
Height cm	170.3 ± 7.4		168.5	166.3 ± 6.6		165	0.052	t
Weight kg	72.3 ± 8.5		71	69.9 ± 10.8		70.5	0.37	t
BMI	24.97 ± 3.01		24.86	25.24 ± 3.38		26.46	0.749	t
ASA								
I	10	35.70%		11	39.30%			
II	14	50.00%		15	53.60%		0.688	X^2
III	4	14.30%		2	7.10%			
Block performance time sec	238.6 ± 28.0		232.5	165.7 ± 31.6		174	***0.000***	m
Tramadol mg								
Tramadol 1st hour								
(–)	20	71.40%		14	50.00%		0.101	X^2
(+)	8	28.60%		14	50.00%			
Tramadol 1st hour	25.0 ± 9.3		20	27.1 ± 9.9		20	0.612	m
Tramadol 3rd hour								
(–)	23	82.10%		20	71.40%		0.342	X^2
(+)	5	17.90%		8	28.60%			
Tramadol 3rd hour	24.0 ± 8.9		20	25.0 ± 9.3		20	0.841	m
Tramadol 6th hour								
(–)	23	82.10%		20	71.40%		0.342	X^2
(+)	5	17.90%		8	28.60%			
Tramadol 6th hour	24.0 ± 8.9		20	20.0 ± 0.0		20	0.206	m
Tramadol 12th hour								
(–)	26	92.90%		22	78.60%		0.127	X^2
(+)	2	7.10%		6	21.40%			
Tramadol 12th hour	20.0 ± 0.0		20	20.0 ± 0.0		20	1	m
Rescue analgesic								
(–)	26	92.90%		23	82.10%		0.225	X^2
(+)	2	7.10%		5	17.90%			
NRS score								
NRS score 1st hour	1.93 ± 1.33		1	2.82 ± 1.85		2	***0.023***	m
NRS score 3rd hour	1.71 ± 1.15		1	2.04 ± 1.45		1.5	0.475	m
NRS score 6th hour	1.54 ± 0.69		1	1.61 ± 0.63		2	0.564	m
NRS score 12th hour	1.18 ± 0.39		1	2.07 ± 1.36		2	***0.001***	m

t, t test/m, Mann-whitney u test/X^2, Chi-square test.
Bold and italic p values represent statistically significant results.

TABLE 2. Demographic data, block performance time and additional analgesic requirements of patients.

	Min–Max	Median	Mean ± sd/n-%	
Age	18.0–84.0	50	49.9 ± 13.1	
Sex				
Male			22	39.30%
Female			34	60.70%
Height cm	156.0–186.0	167.5	168.3 ± 7.2	
Weight kg	50.0–86.0	71	71.1 ± 9.7	
BMI	19.10–32.03	25.91	25.10 ± 3.17	
ASAs				
I			21	37.50%
II			29	51.80%
III			6	10.70%
TAPA Group n			28	50.00%
m-TAPA Group n			28	50.00%
Block performance time sec	89.0–321.0	207.5	202.2 ± 47.2	
Rescue analgesic				
(–)			49	87.50%
(+)			7	12.50%

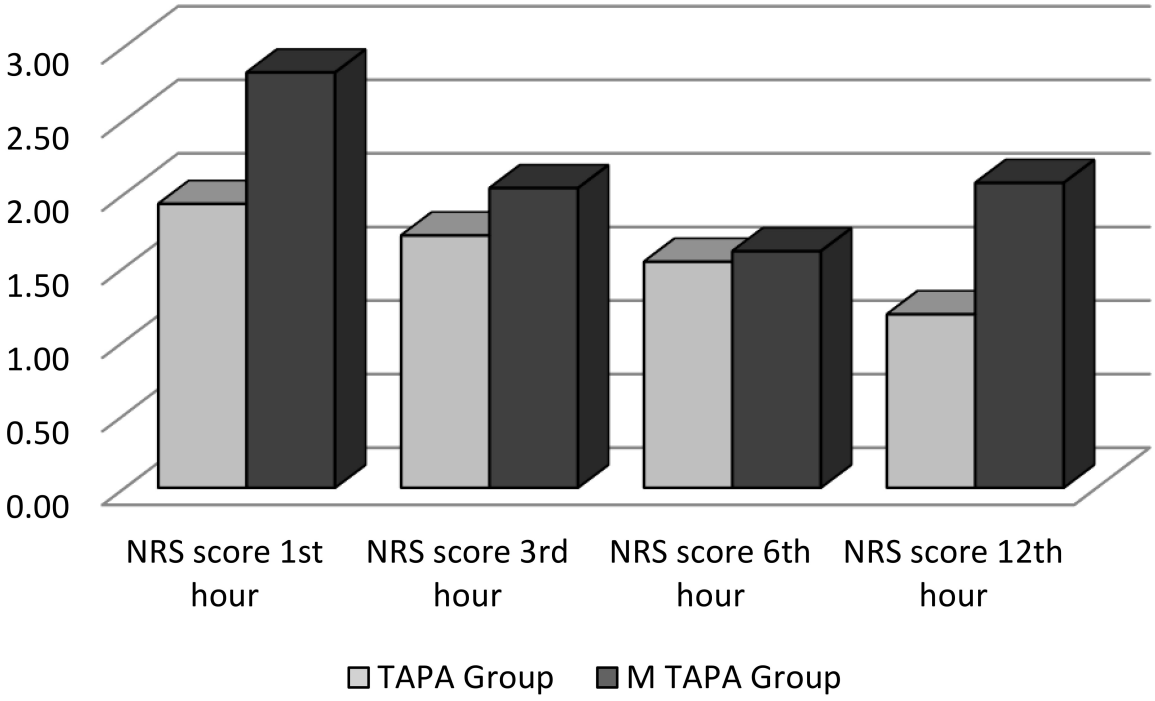

FIGURE 2. The distribution of NRS scores at the 1–3–6 and 12-hour follow-ups.

sensory block of T7–T11 dermatomes but is insufficient for midline incisions [6, 7, 13]. Nevertheless, procedures such as quadratus lumborum blocks, erector spina plane blocks, and thoracic epidural catheters, which give adequate analgesia in laparoscopic cholecystectomy operations, are among the regional anesthesia treatments that cannot be applied or are difficult to apply in the supine position [14–18]. TAPA and m-TAPA blocks were used in the present study after anesthesia induction in the supine position. Since local anesthetic was applied to two anatomical regions in the TAPA block, the procedure took longer than in the m-TAPA block. However, both of our block applications (TAPA: 232.5 sec and m-TAPA:

174 sec) were completed swiftly and efficiently, allowing the surgery to begin as soon as possible.

At T6–T10 levels, intercostal nerves run beneath the chondrium and connect the origin of the transversus abdominis muscle to the cartilage. Serkan Tulgar *et al*. [6] developed these block methods after hypothesizing that local anesthetic administered at the level of the 9th and 10th cartilages and deep to the origin of the transversus abdominus would affect the anterior and lateral cutaneous branches of the intercostal nerves. However, they thought that some procedures would require modification of this block to block some dermatomes, depending on the surgical incision site. They applied local anesthetic only to the lower surface of the chondrium in the patient who underwent laparotomy in the m-TAPA block and provided successful postoperative analgesia. TAPA and m-TAPA blocks were used in abdominal surgery and provided effective analgesia, according to the researchers [6, 7]. Their studies with both blocks were carried out with a small number of patients. In our study with a relatively high number of cases, we planned to investigate both the efficacy of the TAPA block and the adequacy of the m-TAPA block used with the same indication.

In our study, NRS scores for postoperative pain after laparoscopic cholecystectomy operations were lower at 1 hour and 12 hours when the TAPA block was used. Unlike the m-TAPA block, lateral cutaneous branches of the intercostal nerves are blocked in the TAPA block. Moreover, in our study, since local anesthesia was applied to two different points in the TAPA block, the amount and volume of local anesthetic used was higher than those in the m-TAPA block. For these reasons, we thought that the TAPA block would provide more effective postoperative analgesia. In our opinion, the main reason for the low NRS scores at 1 hour and 12 hours is the blockage of the lateral cutaneous branches of the intercostal nerves in the TAPA block. In addition, the large amount and volume of local anesthetic administered in TAPA block may also contribute to the analgesic effect. Although there was a difference between the NRS scores at 1 hour and 12 hours, there was no difference in total and rescue analgesic consumption during the follow-up of the patients. Both block methods provided effective and sufficient postoperative analgesia.

It is plausible that several limitations may have influenced the results obtained. The follow-up of the patients' analgesic use in the study was terminated at 12 hours because the general surgery ward discharged the patients early. Given the duration of the local anesthetic effect, assessing the efficacy of both block methods at 24 hours could be useful for determining long-term effects. Checking dermatome areas with a pinprick test during postoperative follow-up hours may have been beneficial to the procedures' analgesic efficacy.

6. Conclusions

TAPA and m-TAPA blocks, which were defined recently and used in our study in patients undergoing laparoscopic cholecystectomy, effectively reduced postoperative NRS pain scores and significantly reduced the use of additional analgesics.

NRS scores with the TAPA block were significantly lower than those in the m-TAPA group at 1 hour and 12 hours, indicating that the TAPA block provided a more effective analgesic effect at these times. The TAPA block had a significantly longer administration duration. Furthermore, both block applications were completed swiftly, smoothly, and safely, allowing the operations to begin immediately.

In conclusion, we think that TAPA and m-TAPA blocks, administered under ultrasound guidance, will provide effective analgesia in addition to the multimodal analgesia planned for laparoscopic cholecystectomy and other abdominal operations.

AUTHOR CONTRIBUTIONS

TE—designed the study, wrote original draft, reviewed and edited; AE—supervised, edited and corrected English.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This prospective randomized controlled study was done after obtaining ethics committee's permission (SBÜ- Hamidiye KAEK No: 15.09.2021-61566). Written informed consent was obtained from each patient.

ACKNOWLEDGMENT

Thanks to all the peer reviewers for their opinions and suggestions.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Molfino S, Botteri E, Baggi P, Totaro L, Huscher M, Baiocchi GL, *et al*. Pain control in laparoscopic surgery: a case–control study between transversus abdominis plane-block and trocar-site anesthesia. Updates in Surgery. 2019; 71: 717–722.

[2] Tekeli AE, Eker E, Bartin MK, Öner M. The efficacy of transversus abdominis plane block for postoperative analgesia in laparoscopic cholecystectomy cases: a retrospective evaluation of 515 patients. Journal of International Medical Research. 2020; 48: 030006052094405.

[3] Mitra S, Khandelwal P, Roberts K, Kumar S, Vadivelu N. Pain relief in laparoscopic cholecystectomy—a review of the current options. Pain Practice. 2012; 12: 485–496.

[4] Karasu D. Ultrasound-Guided Transversus Abdominis Plane Block for Postoperative Analgesia in Laparoscopic Cholecystectomy: a Retrospective Study. Northern Clinics of Istanbul. 2020; 8: 88–94.

[5] Fernández Martín MT, López Álvarez S, Pérez Herrero MA. Serratus-intercostal interfascial block as an opioid-saving strategy in supra-umbilical open surgery. Revista Espanola de Anestesiologia y Reanimacion. 2018; 65: 456–460.

[6] Tulgar S, Senturk O, Selvi O, Balaban O, Ahiskalioğlu A, Thomas DT, *et al*. Perichondral approach for blockage of thoracoabdominal nerves: Anatomical basis and clinical experience in three cases. Journal of Clinical Anesthesia. 2019; 54: 8–10.

[7] Tulgar S, Selvi O, Thomas DT, Deveci U, Özer Z. Modified thora-

coabdominal nerves block through perichondrial approach (M-TAPA) provides effective analgesia in abdominal surgery and is a choice for opioid sparing anesthesia. Journal of Clinical Anesthesia. 2019; 55: 109.

[8] Khan KK, Khan RI. Analgesic Effect of Bilateral Subcostal Tap Block after Laparoscopic Cholecystectomy. Journal of Ayub Medical College. 2018; 30: 12–15.

[9] Suseela I, Anandan K, Aravind A, Kaniyil S. Comparison of ultrasound-guided bilateral subcostal transversus abdominis plane block and port-site infiltration with bupivacaine in laparoscopic cholecystectomy. Indian Journal of Anaesthesia. 2018; 62: 497–501.

[10] Szental JA, Webb A, Weeraratne C, Campbell A, Sivakumar H, Leong S. Postoperative pain after laparoscopic cholecystectomy is not reduced by intraoperative analgesia guided by analgesia nociception index (ANI®) monitoring: a randomized clinical trial. British Journal of Anaesthesia. 2015; 114: 640–645.

[11] Aygun H, Kavrut Ozturk N, Pamukcu AS, Inal A, Kiziloglu I, Thomas DT, *et al*. Comparison of ultrasound guided Erector Spinae Plane Block and quadratus lumborum block for postoperative analgesia in laparoscopic cholecystectomy patients: a prospective randomized study. Journal of Clinical Anesthesia. 2020; 62: 109696.

[12] Ökmen K, Metin Ökmen B, Topal S. Ultrasound-guided posterior quadratus lumborum block for postoperative pain after laparoscopic cholecystectomy: a randomized controlled double blind study. Journal of Clinical Anesthesia. 2018; 49: 112–117.

[13] Chen Y, Shi K, Xia Y, Zhang X, Papadimos TJ, Xu X, *et al*. Sensory Assessment and Regression Rate of Bilateral Oblique Subcostal Transversus Abdominis Plane Block in Volunteers. Regional Anesthesia and Pain Medicine. 2018; 43: 174–179.

[14] Hajong R, Khariong PDS, Baruah AJ, Anand M, Khongwar D. Laparoscopic cholecystectomy under epidural anesthesia: a feasibility study. North American Journal of Medical Sciences. 2014; 6: 566–569.

[15] Mehta N, Dar MR, Sharma S, Mehta KS. Thoracic combined spinal epidural anesthesia for laparoscopic cholecystectomy: a feasibility study. Journal of Anaesthesiology Clinical Pharmacology. 2016; 32: 224–228.

[16] Daghmouri MA, Akremi S, Chaouch MA, Mesbahi M, Amouri N, Jaoua H, *et al*. Bilateral Erector Spinae Plane Block for Postoperative Analgesia in Laparoscopic Cholecystectomy: a Systematic Review and Meta-analysis of Randomized Controlled Trials. Pain Practice. 2021; 21: 357–365.

[17] Herman JA, Urits I, Kaye AD, Urman RD, Viswanath O. Erector Spinae Plane Block (ESPB) or Quadratus Lumborum Block (QLB-II) for laparoscopic cholecystectomy: Impact on postoperative analgesia. Journal of Clinical Anesthesia. 2020; 66: 109958.

[18] Güven BB, Ertürk T, Güner T, Ersoy A. Abdominal wall blocks for emergency ileostomy operation in a patient with COVID-19 pneumonia: a case report. Brazilian Journal of Anesthesiology. 2021; 71: 572–575.

How to cite this article: Tuna ERTÜRK, Ayşın ERSOY. Postoperative analgesic efficacy of the thoracoabdominal nerves block through perichondrial approach (TAPA) and modified-TAPA for laparoscopic cholecystectomy: a randomized controlled study. Signa Vitae. 2022; 18(2): 114-120. doi:10.22514/sv.2022.004.