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ORIGINAL RESEARCH

Comparison of modified thoracoabdominal nerve block through perichondral approach (M-TAPA block) and trocar site local anesthetic infiltration for pain management in total laparoscopic hysterectomy: a randomized-controlled trial

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Abstract

Background: The Modified Thoracoabdominal Nerve Block Through Perichondral Approach (M-TAPA) is a recently introduced intervention that has demonstrated analgesic efficacy in abdominal surgeries. However, there have been limited studies evaluating its effectiveness in gynecological surgeries. This study aimed to compare the analgesic efficacy of M-TAPA with Local Anesthetic Infiltration (LAI) at port sites in patients undergoing Total Laparoscopic Hysterectomy (TLH). **Methods**: Sixty-three patients scheduled for TLH were randomized to receive either bilateral ultrasound-guided M-TAPA or LAI at port insertion sites. The primary outcome was to evaluate and compare the effect of the M-TAPA block and trocar site LAI on total tramadol consumption within the first 24 hours postoperatively. **Results**: The results indicated no significant differences in cumulative tramadol consumption between the two groups at any time point (p = 0.191). Additionally, the Numerical Rating Scale (NRS) scores at 24 hours postoperatively were similar between the M-TAPA and LAI groups ($p > 0.05$). Moreover, both groups demonstrated an equal rate of rescue analgesic usage (LAI group: 25%, n = 8; M-TAPA group: 25%, n = 8) (p = 0.941), and the incidence of postoperative complications was comparable between the groups ($p > 0.05$). **Conclusions**: In conclusion, the M-TAPA block demonstrated similar postoperative analgesic efficacy to port site local anesthetic injection in patients undergoing TLH. **Clinical Trial Registration**: The trial was registered on ClinicalTrials.gov (identifier: NCT06601413) and conducted in compliance with the CONSORT guidelines.

Keywords

Nerve block; Hysterectomy; Pain management; Laparoscopic surgery; Ultrasonography

1. Introduction

Total laparoscopic hysterectomy (TLH) is one of the most frequently performed gynecologic surgeries, with its popularity increasing steadily in recent years [1, 2]. Compared to total abdominal hysterectomy (TAH), TLH offers several advantages, including improved surgical visualization, reduced intraoperative blood loss, smaller incisions, decreased postoperative adhesion formation and faster patient recovery [3, 4]. Despite being less invasive than TAH, postoperative pain remains a significant issue following TLH. To optimize pain management while minimizing opioid consumption, multimodal analgesia, including non-opioid analgesics and local anesthesia, is commonly employed [2]. Various techniques such as interfascial plane blocks, including the rectus sheath block (RSB), transversus abdominis plane block (TAPB), incisional local anesthetic infiltration and epidural block, are frequently utilized as part of multimodal analgesia in TLH [5, 6].

The modified thoracoabdominal nerve block through perichondrial approach (M-TAPA) block, a recently developed interfascial plane block, has been utilized as part of multimodal analgesia in abdominal surgeries [7–10]. Studies have demonstrated that the M-TAPA block provides extensive coverage, targeting dermatomes between the T6 and T12–L1 levels [11, 12]. Despite the growing interest in regional analgesia techniques for postoperative pain management following TLH, the M-TAPA block technique remains relatively new, and few studies have compared its efficacy with other analgesic techniques in TLH procedures [5, 13–15].

In this study, we hypothesized that the M-TAPA block would result in better postoperative pain scores, reduced opioid consumption, and improved recovery compared to trocar site

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local anesthetic infiltration in patients undergoing TLH. Based on these, we primarily aimed to evaluate and compare the impact of the M-TAPA block and trocar site local anesthetic infiltration on total tramadol consumption within the first 24 hours postoperatively in patients undergoing TLH. Moreover, the secondary objectives included assessing and comparing the effects of the two regimens on postoperative pain management, recovery quality and the incidence of complications.

2. Methods

2.1 Research methodology

This study was designed as a randomized controlled trial with a parallel-group format and conducted at a central tertiary hospital in Turkey. Ethical approval was obtained from the institutional ethics committee of Ankara Etlik City Hospital Clinical Research Ethics Committee No. 1 (ethics committee reference number AESH-EK1-2024-0051). The trial was registered on ClinicalTrials.gov (identifier: NCT06601413), and conducted and reported in compliance with the CONSORT guidelines. The study was conducted on patients scheduled for elective TLH between October 2024 and February 2025. The inclusion criteria were patients aged between 18 and 65 years, with an American Society of Anesthesiologists (ASA) physical status classification of I, II or III. The exclusion criteria included known allergies to bupivacaine, paracetamol or tramadol, coagulopathy, chronic pain conditions, conversion to open surgery, infection at the injection site and morbid obesity, defined as a body mass index (BMI) >35 kg/m^2.

Written informed consent was obtained from all patients one day before surgery, and they were instructed on the use of the Numeric Rating Scale (NRS) and the Quality of Recovery-15 (QoR-15) tool. The NRS score ranges from 0 to 10, where a score of "0" indicates no pain, and "10" indicates the worst pain imaginable. The QoR-15 tool includes items assessing physical independence (2 items), physical comfort (5 items), psychological support (2 items), emotional state (4 items) and pain (2 items), with a total score ranging from 0 (indicating poor recovery) to 150 (indicating optimal recovery) [16]. Although the QoR-15 was originally developed in English, the official Turkish version (QoR-15-T) was used in this study [17].

Patients scheduled for TLH in the gynecologic surgery operating room were randomly assigned to one of two groups using a computer-assisted randomization method (JMP, version 12.0.1, SAS Institute Inc., Cary, NC, USA): the LAI group (port-site local anesthetic infiltration of the four trocar insertion sites) and the M-TAPA group (an ultrasound-guided M-TAPA block group).

2.2 Anesthesia management

All patients were instructed to complete the QoR-15-T questionnaire the night before surgery, and all patients were monitored preoperatively using the standard ASA. Anesthesia induction was achieved with intravenous propofol (2 mg/kg) and fentanyl (1 μg/kg). Intravenous administration of rocuronium (0.6 mg/kg) was performed to ensure adequate muscle relaxation, followed by endotracheal intubation. Intraoperative anesthesia was maintained using remifentanil infusion and sevoflurane.

The surgical procedure was performed using the standard four-trocar technique with ports measuring 12 mm, 10 mm and 5 mm in diameter. Ondansetron (4 mg) was administered intravenously to all patients 30 minutes before emergence from anesthesia. Neuromuscular blockade was reversed at the end of the surgery with intravenous administration of sugammadex (2 mg/kg). Postoperative analgesia was provided by administering intravenous tramadol (1 mg/kg) and paracetamol (15 mg/kg) at the conclusion of the procedure.

2.3 Modified thoracoabdominal nerve block through perichondral approach (M-TAPA)

In the M-TAPA group, the patients were positioned appropriately at the end of the surgery, and a bilateral M-TAPA block was performed under ultrasound guidance (USG). The procedure was conducted with the patient in the supine position, using a 10 cm, 22 G block needle and a 6–13 MHz linear ultrasound probe (HFL50x, Edge, FUJIFILM Sonosite, Bothell, WA, USA). The block was administered by the same anesthesiologist, who had over a decade of experience in regional anesthesia, before the patient emerged from general anesthesia. A linear high-frequency ultrasound probe was utilized to visualize the transversus abdominis, internal oblique, and external oblique muscles at the costochondral angle in the sagittal plane at the 10th costal margin. A 20 mL injection of 0.25% bupivacaine was administered at the level of the 10th rib along the midclavicular line, between the superior fascia of the transversus abdominis muscle and the inferior fascia of the costochondral tissue (arcus costarum) (Fig. 1). The same technique was repeated on the contralateral side.

2.4 Trocar site local anesthetic infiltration (LAI)

The trocar insertion sites included the left and right quadrants of the abdomen, the suprapubic midline and the umbilicus. In the LAI group, at the end of the surgery and before the patient woke up from general anesthesia, the surgeon performed a subcutaneous infiltration of 10 mL of 0.25% bupivacaine at each of the four laparoscopic port sites for local anesthesia.

Following the administration of the block, the patient was awakened from anesthesia and transferred to the post-anesthesia care unit (PACU) for observation. Intravenous patient-controlled analgesia (PCA) with tramadol was initiated in the PACU. The PCA device was set to deliver a bolus dose of 20 mg tramadol with a 30-minute lockout interval and no continuous infusion, using a solution of 500 mg tramadol diluted in 100 mL of saline. Patients were discharged from the PACU to their respective wards once a Modified Aldrete Recovery Score of 9 or higher was achieved.

2.5 Study outcomes

The duration of surgery, anesthesia and PACU stay were recorded in minutes. Postoperative pain assessments were performed by an independent researcher who was blinded to group assignments. Pain intensity was measured using the

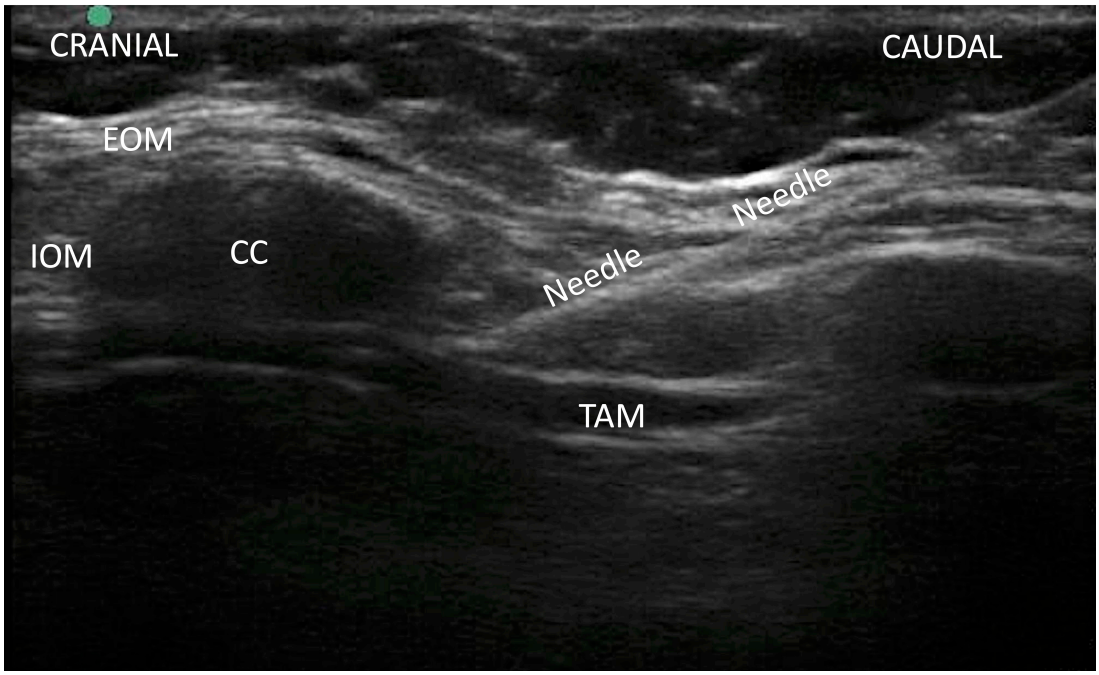

FIGURE 1. Ultrasound guidance image during M-TAPA block procedure. CC: costal cartilage; EOM: external oblique muscle; IOM: internal oblique muscle; TAM: transversus abdominis muscle.

NRS both at rest (while lying supine) and during movement (specifically, when transitioning from a supine to a sitting position). NRS scores were documented at multiple time points: in the PACU and at 1, 2, 4, 8, 12 and 24 hours postoperatively. Rescue analgesia, comprising 75 mg intramuscular diclofenac, was administered if the NRS score exceeded 4. If needed, ondansetron (4 mg) was provided as an emergency antiemetic for postoperative nausea and vomiting. Postoperative tramadol consumption via PCA device was recorded at 2, 4, 8, 12 and 24 hours after surgery. Postoperative complications, including nausea/vomiting, shoulder pain and bradycardia, were monitored during the first 24 hours. Recovery quality was assessed at the 24th postoperative hour using the QoR-15-T questionnaire.

The primary outcome measure was the total tramadol consumption during the first 24 hours after surgery. Secondary outcomes included NRS scores, the percentage of patients requiring rescue analgesia, the incidence of postoperative complications, and QoR-15-T scores.

2.6 Statistical analysis

Sample size was calculated based on retrospective data from TLH cases at our institution using the G*Power (version 3.1.9.7, Heinrich Heine University Düsseldorf, Düsseldorf, NRW, Germany) software. The data indicated that the mean total tramadol consumption at 24 hours was 141 $\pm$ 51 mg in patients who received port-site infiltration. To detect a minimum 35% reduction in 24-hour tramadol consumption with a significance level (α) of 0.05 and a power of 99%, the required sample size was calculated as 30 patients per group (degrees of freedom: 58). To account for potential data loss, the study aimed to include a total of 66 patients.

The Shapiro-Wilk test (for $n < 50$) was employed to assess the normality of continuous data. Descriptive statistics were presented as frequency (n/total N) for categorical variables, and as mean (standard deviation (SD)) or median (interquartile range (IQR)) for normally or non-normally distributed continuous variables, respectively. Group comparisons for normally and non-normally distributed continuous data were performed using the independent *t*-test or Mann-Whitney U test, respectively. The frequency distribution of categorical variables between groups was evaluated using the chi-square test. A *p*-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using the SPSS software package (version 26, IBM Corp., Armonk, NY, USA).

3. Results

Between October 2024 and February 2025, a total of 72 patients were assessed for eligibility. Among them, 68 patients were randomly assigned to either the M-TAPA group or the LAI group (Fig. 2). However, two patients in the M-TAPA group and three in the LAI group were excluded due to an unplanned conversion to open surgery, leading to a final analysis sample size of 63 patients. The baseline characteristics of the two groups are presented in Table 1, and we observed no significant differences between them in terms of age, height, weight, BMI, ASA physical status or comorbidities.

Analysis of secondary outcomes revealed no significant differences between the two groups regarding QoR-15T scores, anesthesia duration, PACU stay time or length of hospital stay, as shown in Table 2. However, the duration of surgery was significantly shorter in the LAI group compared to the M-TAPA group, with a mean difference of 5.5 minutes (132.5 (27.2) *vs.* 138.1 (34.4); 95% confidence interval (CI): −10.1 to 21.2; $p = 0.037$).

Pain intensity, measured using the NRS, did not signifi-

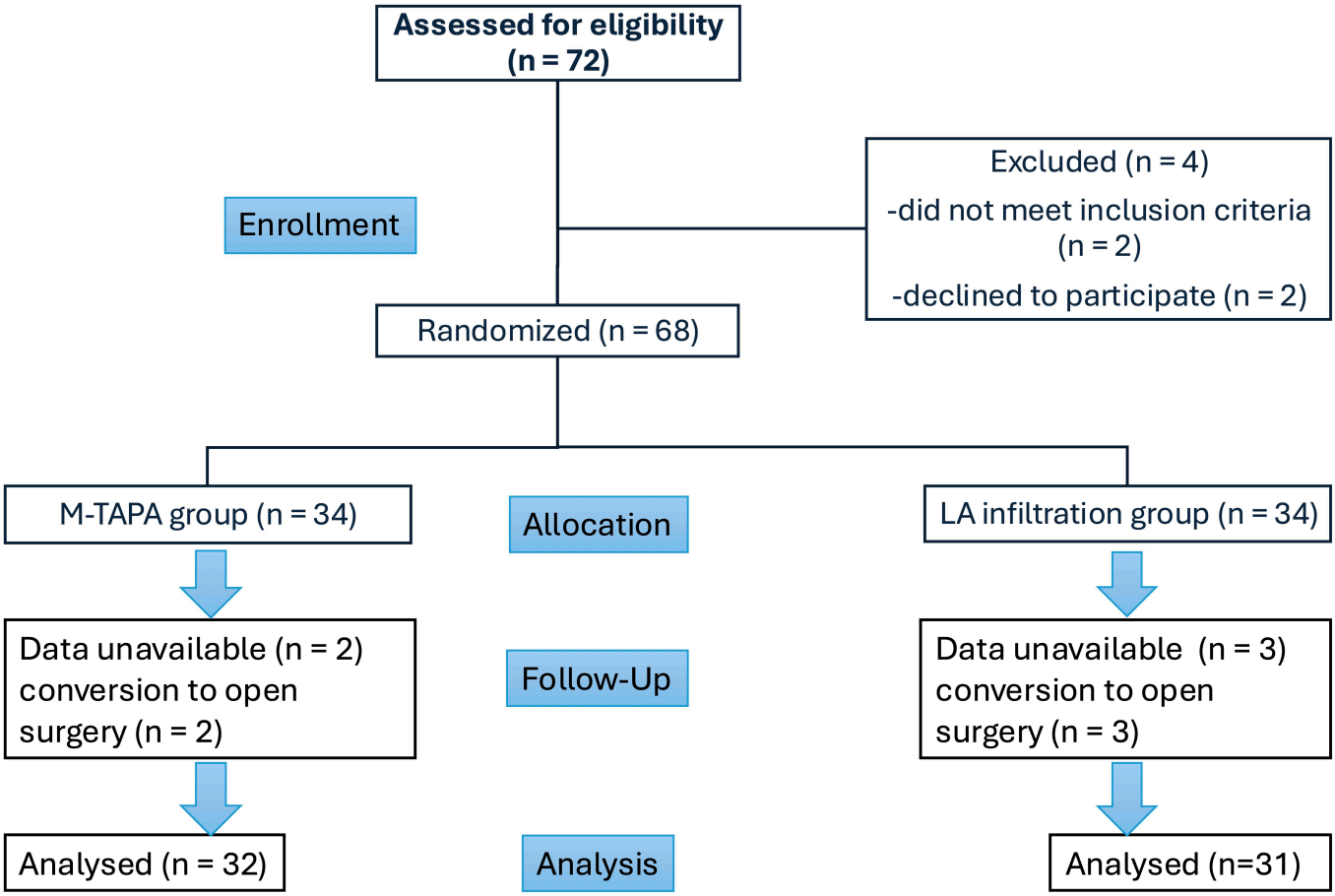

FIGURE 2. Consort Flow diagram of the study. M-TAPA: modified thoracoabdominal nerves block through perichondrial approach; LA: local anesthetic.

TABLE 1. Baseline characteristics of the study participants.

Characteristic	All participants (n = 63)	M-TAPA group (n = 32)	LAI group (n = 31)
Age (yr), median (IQR)	48 (8)	47 (6)	50 (10)
Weight (kg), mean (SD)	72.0 (9.5)	76.0 (9.2)	69.5 (8.8)
Height (cm), median (IQR)	161 (5)	162 (7)	160 (4)
Body mass index (kg/m^2), mean (SD)	27.9 (3.5)	28.9 (3.4)	26.8 (3.2)
ASA physical status, n/total N (%)			
ASA I	22/63 (34.9%)	10/32 (31.3%)	12/31 (38.7%)
ASA II	41/63 (65.1%)	22/32 (68.8%)	19/31 (61.3%)
Co-morbidity, n/total N (%)			
Hypertension	19/63 (30.2%)	12/32 (37.5%)	7/31(22.6%)
Diabetes mellitus	13/63 (20.6%)	4/32 (12.5%)	9/31 (29.0%)
Thyroid Disease	15/63 (23.8%)	10/32 (31.3%)	5/31 (16.1%)
Rheumatologic Disease	1/63 (1.6%)	1/32 (3.1%)	0/31 (0.0%)
COPD, Asthma	4/63 (6.3%)	1/32 (3.1%)	3/31 (9.7%)

M-TAPA: modified thoracoabdominal nerves block through perichondrial approach; LAI: local anesthetic infiltration; ASA: American Society of Anesthesiologists; COPD: Chronic obstructive pulmonary disease; IQR: interquartile range; SD: standard deviation.

TABLE 2. Comparison of QoR-T-15 scores; duration of surgery, anesthesia, PACU and LOHS.

	All participants (n = 63)	M-TAPA group (n = 32)	LAI group (n = 31)	Difference in Means (95% CI)	*p* value
Preoperative QoR-T-15 score, mean (SD)	132.20 (10.80)	133.50 (9.00)	130.90 (12.40)	2.60 (−2.80 to 8.10)	0.071
Postoperative QoR-15T score, mean (SD)	112.00 (12.00)	113.00 (11.00)	112.00 (13.00)	1.00 (−5.40 to 7.70)	0.218
Duration of anesthesia (min), mean (SD)	148.60 (32.00)	154.40 (34.30)	142.60 (28.70)	11.70 (−4.10 to 27.70)	0.077
Duration of surgery (min), mean (SD)	135.40 (30.90)	138.10 (34.40)	132.50 (27.20)	5.50 (−10.10 to 21.20)	0.037
				Difference in Medians (95% CI)	
PACU time (min), median (IQR)	30 (5)	30 (5)	30 (5)	0.00 (0.24 to 0.26)	0.250
LOHS (d), median (IQR)	2 (0)	2 (0)	2 (0)	0.00 (0.60 to 0.62)	0.321

M-TAPA: modified thoracoabdominal nerves block through perichondrial approach; LAI: local anesthetic infiltration n: number; QoR-T-15: quality of recovery-15; PACU: post-anesthesia care unit; LOHS: length of hospital stay; SD: standard deviation; CI: confidence interval; IQR: interquartile range. $p < 0.05$ is considered statistically significant.

cantly differ between the two groups at any time point (Table 3). Similarly, no significant differences were observed in cumulative tramadol consumption between the groups at any of the recorded time points (Table 4). The mean (SD) cumulative 24-hour tramadol consumption was 132 (56) mg in the M-TAPA group and 131 (44) mg in the LAI group, with a difference in means of 0.8 (95% CI, −24.8 to 26.6; $p = 0.191$).

Postoperative complications were observed in 16 of the 63 patients. The incidence of postoperative complications, including bradycardia, shoulder pain, nausea or vomiting, was similar between both groups (Fig. 3). The proportion of patients requiring rescue analgesia was comparable between the groups (M-TAPA group, 8/32 patients (25%) *vs.* LAI group, 8/31 patients (25.8%)) (risk difference, 0.9%; 95% CI, 0.5 to 2.9%; $p = 0.941$). Moreover, no complications related to the injections were reported in any of the patients.

TABLE 3. Comparison of postoperative pain scores with numeric rating scale (0–10) at rest (R) and during movement (M).

	All participants (n = 63) Median (IQR)	M-TAPA group (n = 32) Median (IQR)	LAI group (n = 31) Median (IQR)	Difference in Medians (95% CI)	*p* value
PACU, (R)	4.0 (3.0)	4.0 (3.0)	4.0 (4.0)	0.00 (0.24 to 0.26)	0.251
1 h postoperatively, (R)	3.0 (2.0)	3.0 (3.0)	4.0 (2.0)	−1.00 (0.08 to 0.09)	0.090
2 h postoperatively, (R)	3.0 (3.0)	2.5 (2.0)	3.0 (2.0)	−0.50 (0.24 to 0.26)	0.255
4 h postoperatively, (R)	2.0 (2.0)	2.0 (2.0)	2.0 (2.0)	0.00 (0.52 to 0.54)	0.524
8 h postoperatively, (R)	1.0 (2.0)	1.0 (2.0)	2.0 (2.0)	−1.00 (0.17 to 0.18)	0.171
12 h postoperatively, (R)	1.0 (2.0)	1.0 (2.0)	1.0 (2.0)	0.00 (0.79 to 0.80)	0.795
24 h postoperatively, (R)	0.0 (1.0)	1.0 (1.0)	0.0 (1.0)	1.00 (0.09 to 0.10)	0.102
PACU, (M)	5.0 (4.0)	4.5 (4.0)	5.0 (4.0)	−0.50 (0.43 to 0.45)	0.444
1 h postoperatively, (M)	4.0 (2.0)	4.0 (3.0)	5.0 (1.0)	−1.00 (0.09 to 0.10)	0.999
2 h postoperatively, (M)	3.0 (2.0)	2.5 (2.0)	4.0 (1.0)	−1.50 (0.30 to 0.32)	0.301
4 h postoperatively, (M)	3.0 (1.0)	2.0 (2.0)	3.0 (1.0)	−1.00 (0.24 to 0.26)	0.257
8 h postoperatively, (M)	2.0 (2.0)	2.0 (1.0)	2.0 (2.0)	0.00 (0.11 to 0.13)	0.126
12 h postoperatively, (M)	1.0 (2.0)	1.0 (2.0)	1.0 (2.0)	0.00 (0.57 to 0.59)	0.587
24 h postoperatively, (M)	1.0 (2.0)	1.0 (2.0)	0.0 (1.0)	1.00 (0.10 to 0.11)	0.110

M-TAPA: modified thoracoabdominal nerves block through perichondrial approach; LAI: local anesthetic infiltration; n: number; PACU: post-anesthesia care unit; IQR: interquartile ranges; R: rest; M: movement; CI: confidence interval.

TABLE 4. Comparison of cumulative tramadol consumption in the first 24 hours.

	All participants (n = 63) Median (IQR)	M-TAPA group (n = 32) Median (IQR)	LAI group (n = 31) Median (IQR)	Difference in Medians (95% CI)	*p* value
2-hour tramadol consumption (mg)	40 (40)	40 (40)	40 (40)	0.00 (0.82 to 0.84)	0.829
4-hour tramadol consumption (mg)	80 (40)	80 (55)	80 (40)	0.00 (0.71 to 0.72)	0.716
8-hour tramadol consumption (mg)	100 (60)	100 (75)	100 (60)	0.00 (0.60 to 0.62)	0.611
12-hour tramadol consumption (mg)	120 (80)	120 (60)	120 (80)	0.00 (0.64 to 0.66)	0.644
	Mean (SD)	Mean (SD)	Mean (SD)	Difference in Means (95% CI)	
24-hour tramadol consumption (mg)	132 (50)	132 (56)	131 (44)	0.80 (−24.80 to 26.60)	0.191

M-TAPA: modified thoracoabdominal nerves block through perichondrial approach; LAI: local anesthetic infiltration; n: number; IQR: interquartile ranges; CI: confidence interval.

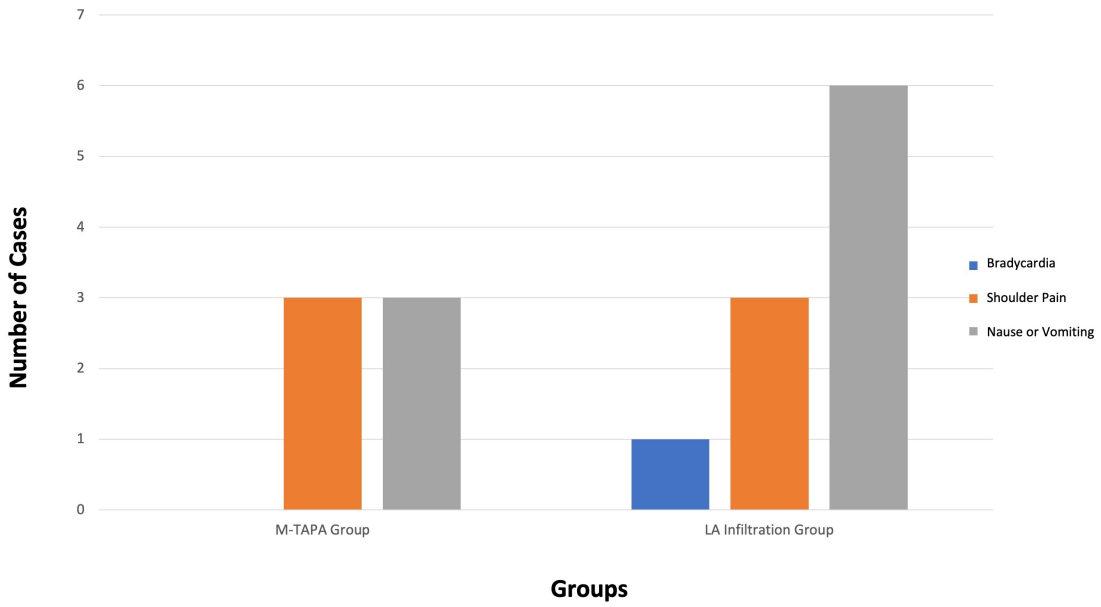

FIGURE 3. Comparison of postoperative complications. M-TAPA: modified thoracoabdominal nerves block through perichondrial approach; LA: local anesthetic.

4. Discussion

This study compared the efficacy of the M-TAPA block, performed under ultrasound guidance, with LAI at trocar entry sites in patients undergoing TLH in terms of total tramadol consumption, NRS pain scores and quality of recovery. The results demonstrated no significant differences between the M-TAPA block and LAI groups regarding total tramadol consumption, NRS pain scores or QoR-15-T scores, suggesting that the M-TAPA block provides postoperative analgesia comparable to that of LAI in TLH. Given its safety profile and ease of application, the M-TAPA block might be considered a viable alternative for patients in whom LAI is not preferred, particularly those at risk of fat necrosis or hematoma development.

Pain management in TLH remains a clinical challenge, with reported incidence rates ranging from 35% to 63% [13]. This postoperative pain is primarily triggered by perioperative factors, including pneumoperitoneum, intra-abdominal tension, blood accumulation within the abdominal cavity and pelvic dissection [18]. Due to the multifactorial nature of pain in TLH, a multimodal analgesic approach is necessary to effectively address these contributing factors. The M-TAPA block, classified as an interfascial plane block, has been shown to be a safe and effective component of multimodal analgesia in abdominal surgeries [7–10, 19]. However, studies evaluating the postoperative analgesic efficacy of the M-TAPA block, specifically in TLH, remain limited. In a pilot study comparing the M-TAPA block and the Oblique Subcostal Transversus Abdominis Plane (OSTAP) block, no significant differences in pain scores or QoR-15 scores were found between the two techniques in patients undergoing TLH [20]. Similarly, a retrospective study comparing the M-TAPA block with LAI at trocar sites reported similar postoperative analgesic consumption and pain scores between the two methods [21].

Although Atsumi *et al.* [21] also previously compared LAI at trocar sites with the M-TAPA block, the retrospective design and the lack of standardized anesthesia management limited the reliability of their findings. The M-TAPA block in their study involved the administration of 25 mL of ropivacaine, and postoperative analgesia was not standardized, leading to

comparisons based solely on the need for rescue analgesics. In contrast, our study employed a more systematic approach by using tramadol PCA to standardize postoperative analgesia, allowing for a more accurate assessment of analgesic needs. Additionally, unlike the study by Atsumi *et al*. [21], we used the QoR-15-T score to evaluate postoperative recovery and patient satisfaction, finding no significant difference between the two groups in this regard.

Our data analysis indicated that the surgical time in the LAI group was significantly shorter compared to the M-TAPA group, with a mean difference of 5.5 minutes. Despite being statistically significant, this difference was not clinically meaningful. In our study, LAI was performed by the surgeon immediately after the trocars were removed and before the sites were closed with sutures. Therefore, the slight increase in surgical time observed in the M-TAPA group may be attributed to the inclusion of the USG local anesthetic application time within the calculated surgical duration in the LAI group.

In our study, the postoperative analgesic efficacy of the M-TAPA block applied during TLH was found to be comparable to that of LAI at trocar entry sites. However, there are certain clinical situations where LAI at trocar sites may not be feasible, such as in cases of obesity, increased bleeding risk, elevated infection risk or surgeon preference. For instance, Stamenkovic *et al*. [22] reported that LAI may increase the risk of hematoma formation, as well as local infection and tissue reaction, particularly when sterilization is inadequate. Additionally, blind anesthetic injections into multiple trocar sites increase the potential for vascular injury, leading to complications such as hematoma. In contrast, the M-TAPA block performed under USG is a suitable alternative to mitigate these risks as it may not only provide effective analgesia but is also considered safe against complications like tissue reaction and hematoma formation due to its precise, ultrasound-guided application. Similarly, Tulgar *et al*. [23] reported that the M-TAPA block offers effective pain control in abdominal surgeries, reduces the need for systemic analgesics, and is associated with a lower risk of complications. Moreover, the M-TAPA block has been demonstrated to effectively reduce postoperative pain in high-risk patients when incorporated into a multimodal analgesia approach. This reduction in pain subsequently decreases opioid consumption, thereby minimizing opioid-related side effects and contributing to shorter hospital stay [23, 24]. Thus, the M-TAPA block may be regarded as a safe and effective pain management method, especially in cases where LAI is not preferred.

Previous studies have also shown that the M-TAPA block is more effective than LAI at trocar entry sites in various abdominal surgeries, such as laparoscopic cholecystectomy [10, 20, 25]. However, the literature on pain characteristics following TLH indicates that perineal pain is predominant, likely due to pelvic nerve manipulation during uterine incision or removal and the surrounding ligament dissection [18]. Moreover, it has been hypothesized that visceral pain following TLH is more pronounced than incisional pain because of this mechanism. The M-TAPA block is designed to target the cutaneous branches of the thoracoabdominal nerves at the T6–T12/L1 levels and therefore, has limited effects on visceral pain. Consistent with our findings, Atsumi *et al*. [21] conducted a retrospective study comparing the M-TAPA block with LAI at wound sites following TLH and reported similar postoperative analgesic consumption and pain scores between the two methods, which might be attributed to the limited effect of the M-TAPA block on visceral pain in TLH.

There are several limitations to our study. First, as this was a single-center study with a limited sample size, the results may not be generalizable to a broader population. The sample size was determined based on the analgesic consumption of patients who received local anesthetic infiltration rather than those who underwent M-TAPA, which may have limited the ability to detect differences compared to existing data. Future studies should take this factor into account, considering that the difference between the two groups might be minimal, and could include a larger patient cohort to enhance statistical power. Additionally, we did not assess the specific dermatomes affected by either the M-TAPA block or LAI, which could have provided more precise data on the block's efficacy. Furthermore, the TLH procedures were performed by multiple surgeons, potentially introducing variability in surgical technique. Lastly, we did not evaluate the specific characteristics of pain when assessing its severity, which may have influenced the interpretation of pain scores.

5. Conclusions

This present study compared two different analgesic regimens and demonstrated that the postoperative analgesic efficacy of the M-TAPA block in TLH was comparable to that of LAI administered at trocar entry sites. These findings suggest that the M-TAPA block can be safely and effectively utilized for postoperative analgesia in TLH, particularly in cases where LAI at trocar sites is not feasible or preferred.

AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

AUTHOR CONTRIBUTIONS

EE, VA—created the methodology; conceptualized; and supervised the study; administered the project. GBB, UK—provided resources and visualization. FS—took part in investigation. OO and UK—provided data curation. MEİ, EE, FS—wrote the original draft. EE, KU and SF—reviewed and edited the original draft.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The ethical approval of this study was authorized by the Ankara Etlik City Hospital, University of Health Sciences Medical Research Assessment Committee with the decision number AESH-EK1-2024-0051 on the 03 May 2024. Written informed consent was obtained from all patients.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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