Journal of Pain Research

Dovepress
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ORIGINAL RESEARCH

Comparison of the Postoperative Analgesic Effects of TAP and M-TAPA Blocks in Laparoscopic Appendectomy: A Pilot Randomized Controlled Trial

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Purpose: Effective postoperative pain management is essential following laparoscopic appendectomy. This exploratory pilot randomized controlled trial aimed to compare the postoperative analgesic efficacy of the transversus abdominis plane (TAP) block and the modified thoracoabdominal nerve block through the perichondrial approach (M-TAPA) in patients undergoing laparoscopic appendectomy.

Patients and Methods: This prospective, double-blind, single-center exploratory pilot randomized controlled trial included 30 adult patients (ASA I–III) scheduled for laparoscopic appendectomy due to uncomplicated acute appendicitis. Patients were randomly allocated to receive either bilateral TAP block (Group T, n = 15) or bilateral M-TAPA block (Group M, n = 15) under ultrasound guidance following induction of general anesthesia. Both groups received standardized multimodal analgesia. Postoperative pain intensity assessed by Numeric Rating Scale (NRS) was the primary outcome. Secondary outcomes included 24-hour tramadol consumption, Quality of Recovery-15 (QoR-15) scores, and adverse events. Pain assessments were performed at 1, 6, 12, 18, and 24 hours postoperatively by a blinded assessor.

Results: All randomized patients completed the study. Demographic and clinical characteristics did not differ significantly between groups. Resting and dynamic NRS scores did not differ significantly between the TAP and M-TAPA groups at any postoperative time point (all $p > 0.05$). Median 24-hour tramadol consumption was 50 mg (0–50) in both groups. No statistically significant difference was detected in QoR-15 scores between groups ($p = 0.51$). No block-related complications or opioid-related adverse effects were observed.

Conclusion: In this exploratory pilot randomized controlled trial, M-TAPA did not demonstrate superiority over the TAP block with respect to postoperative pain intensity, opioid consumption, or quality of recovery following laparoscopic appendectomy. Within a standardized multimodal analgesia regimen, both techniques were associated with low pain scores and minimal opioid requirements. Larger, adequately powered randomized trials are warranted to confirm these preliminary findings.

Keywords: laparoscopic appendectomy, regional anesthesia, postoperative pain, patient satisfaction

Introduction

Laparoscopic appendectomy is the most commonly preferred surgical technique for patients diagnosed with acute appendicitis.[1] Compared to open surgery, this minimally invasive procedure offers several advantages, including lower complication rates, reduced postoperative pain, and a faster return to normal daily activities.[2] However, despite its minimally invasive nature, postoperative pain cannot be completely eliminated following laparoscopic appendectomy;

https://doi.org/10.2147/JPR.S575244
Received: 28 October 2025
Accepted: 22 January 2026
Published: 28 January 2026

this pain may contribute to chronic pain development, limit early mobilization, and prolong the duration of hospital stay.[3,4]

For postoperative analgesia following laparoscopic appendectomy, various methods have been employed, including paracetamol, nonsteroidal anti-inflammatory drugs (NSAIDs), ketamine, local anesthetic infiltration at the incision site, intraperitoneal local anesthetic administration, and epidural analgesia.[4] In recent years, the importance of multimodal analgesia strategies has increased substantially, primarily to prevent adverse effects associated with opioid use.[5] In this setting, peripheral nerve blocks have gained popularity as adjunctive interventions to conventional analgesic strategies, aiming to reduce the need for opioids. To achieve effective analgesia after laparoscopic abdominal surgeries, several truncal nerve block techniques—such as the lateral transversus abdominis plane (TAP) block, oblique subcostal TAP block, modified thoracoabdominal nerve block through the perichondrial approach (M-TAPA), and the quadratus lumborum block (QLB) have been described and clinically applied.[6–9]

M-TAPA was first described by Tulgar et al[10] in 2019. In this technique, the local anesthetic (LA) is administered just posterior to the costal cartilage and superior to the transversus abdominis muscle, targeting the anterior and lateral cutaneous branches of the thoracoabdominal nerves corresponding to the T5–T12/L1 dermatomes.[10–12]

The TAP block, initially described by Rafi in 2001,[13] consists of administering local anesthetic into the fascial plane between the internal oblique and transversus abdominis muscles of the abdominal wall. By blocking the thoracoabdominal nerves that traverse the TAP plane, the block can provide sensory coverage ranging from the T6–T9 dermatomes in the upper abdomen to the T10–L1 dermatomes in the lower abdomen.[14,15] Thus, the TAP block has the potential to achieve anesthesia across the anterior abdominal wall within the T6–L1 range.[14,15]

To date, randomized controlled trials directly comparing the M-TAPA and TAP blocks in patients undergoing laparoscopic appendectomy are lacking. Therefore, the present study was designed as an exploratory pilot randomized controlled trial to compare the postoperative analgesic efficacy of TAP and M-TAPA blocks in patients undergoing laparoscopic appendectomy.

Materials and Methods

Study Design

This prospective, double-blind, single-center exploratory pilot randomized controlled trial was approved by the local ethics committee of Sivas Cumhuriyet University (Date: 06.06.2023; Approval No: 2023–06/05). All participants received both verbal and written information regarding the study procedures and the block interventions, and written informed consent was subsequently obtained. The study was registered at ClinicalTrials.gov under the identifier NCT06483581. This report adheres to the Consolidated Standards of Reporting Trials (CONSORT) guidelines for randomized controlled trials. This study was conducted in accordance with the principles of the Declaration of Helsinki.

Study Population

A total of 30 adult patients aged 18–85 years with American Society of Anesthesiologists (ASA) physical status I–III who were scheduled for laparoscopic appendectomy for uncomplicated acute appendicitis were enrolled in the study. Exclusion criteria included refusal to provide informed consent, body weight below 50 kg, pregnancy, chronic opioid use, known allergy to local anesthetics, coagulopathy or use of anticoagulant therapy, signs of infection at the block injection site, diagnosis of complicated appendicitis (including perforation, abscess, or generalized peritonitis), conversion to open surgery, intraoperative hemodynamic instability, and inability to cooperate with or comprehend postoperative pain and recovery assessments, including the Numeric Rating Scale (NRS) and the Quality of Recovery-15 (QoR-15) questionnaire.

General Anesthesia

Prior to general anesthesia induction, standard monitoring was applied to all patients, comprising electrocardiography, non-invasive blood pressure, and peripheral oxygen saturation measurements. Anesthesia induction was achieved with fentanyl (1 μg/kg), thiopental sodium (5–7 mg/kg), and rocuronium (0.5 mg/kg). After intubation, patients were

mechanically ventilated with a tidal volume of 6–8 mL/kg, a respiratory rate of 12–16 breaths/min, PEEP of 5 cmH_2O, and a fresh gas flow of 2 L/min with a 50% air–50% oxygen mixture containing sevoflurane. End-tidal CO_2 was kept between 30 and 35 mmHg.

During surgery, patients received an additional fentanyl dose (1 μg/kg) if heart rate or mean arterial pressure rose by more than 20% relative to baseline measurements. All laparoscopic appendectomy procedures were conducted by a single surgical team following a standardized three-port approach. Post-anesthesia induction, an 11 mm umbilical camera port was inserted via an open technique to establish pneumoperitoneum with carbon dioxide insufflation. Two additional 5 mm working ports were then placed in the suprapubic region and left lower quadrant, maintaining intra-abdominal pressure at 10–12 mmHg throughout the operation.

Within the multimodal analgesia protocol, patients received 50 mg of dexketoprofen and 1 g of paracetamol intravenously about 10 minutes before surgical closure. Following the completion of the procedure, extubation was performed after administration of 2 mg/kg sugammadex.

Grouping and Randomization

Patients were preoperatively randomized into two groups—the M-TAPA group (Group M, n = 15) and the TAP group (Group T, n = 15)—using a computer-generated random sequence created with the "Research Randomizer" software. To ensure allocation concealment, group assignments were prepared in advance by an investigator not involved in patient recruitment, block performance, or outcome assessment. The allocation sequence was concealed until patient enrollment was completed and the assigned intervention was implemented. Postoperative assessments were conducted by a second anesthesiologist who was independent of the study procedures and blinded to group allocation. This anesthesiologist recorded postoperative pain scores, additional analgesic requirements, adverse events, and Quality of Recovery-15 (QoR-15) scores.

Block Interventions

The M-TAPA block was performed after endotracheal intubation and prior to the surgical incision. Bilateral M-TAPA blocks were conducted aseptically with the aid of a high-frequency linear ultrasound probe (6–10 MHz; Mylab 30 Gold, Esaote, Toscana, Italy) and an 80-mm echogenic needle (Stimuplex Ultra 360, B. Braun, Melsungen, Germany). The ultrasound probe was positioned in the sagittal plane at the 9th–10th costal level over the costochondral junction. To visualize the inferior surface of the costal cartilage, the probe was tilted at an appropriate angle to achieve a deeper imaging window. The needle was advanced in-plane through the skin and subcutaneous tissue to the target area immediately beneath the cartilage. Correct placement within the injection plane was confirmed using hydrodissection with 5 mL of saline. Subsequently, a total of 40 mL of local anesthetic was delivered, with 20 mL of 0.25% bupivacaine injected bilaterally.

Under aseptic conditions, bilateral TAP blocks were carried out with a high-frequency linear ultrasound probe (6–10 MHz; Mylab 30 Gold, Esaote, Toscana, Italy) and an 80-mm echogenic needle (Stimuplex Ultra 360, B. Braun, Melsungen, Germany). The probe was placed in the transverse plane along the mid-axillary line between the costal margin and the iliac crest. The ultrasound examination delineated the anatomical layers as follows: subcutaneous tissue, external oblique, internal oblique, transversus abdominis muscles, and the peritoneum. The needle was advanced in-plane carefully through the tissue layers and fascial planes. When a characteristic "click" was felt as the needle passed through the fascia of the internal oblique muscle, the tip was fixed in position within the target injection plane between the internal oblique and transversus abdominis muscles. Placement accuracy was confirmed through hydrodissection with 5 mL of saline. Subsequently, a total of 40 mL of local anesthetic was delivered, with 20 mL of 0.25% bupivacaine injected bilaterally.

All M-TAPA and TAP block interventions were performed by the same anesthesiologist to ensure procedural consistency.

Pain Assessment

Postoperative pain was quantified using the Numeric Rating Scale (NRS), ranging from 0 ("no pain") to 10 ("worst imaginable pain"). Patients' pain scores, including both static and dynamic NRS, were recorded at regular intervals at 1,

6, 12, 18, and 24 hours postoperatively. All patients received preoperative instruction on the use of the NRS and were educated on how to accurately report and evaluate their pain.

Postoperative Analgesia

All patients received a multimodal analgesia regimen consisting of ibuprofen 400 mg three times daily (total daily dose of 1200 mg) during the first 24 hours postoperatively. Patients reporting an NRS score of ≥4 at any postoperative assessment received rescue analgesia in the form of 50 mg intravenous tramadol.

Outcome Measures and Data Collection

Demographic and clinical data, including age, sex, body mass index (BMI), and ASA classification, were recorded for all patients. Postoperative NRS scores and total tramadol consumption were monitored and documented over a 24-hour period. Following the 24-hour observation period, the Quality of Recovery-15 (QoR-15) assessment was administered to all participants.

Postoperative pain intensity measured by the Numeric Rating Scale (NRS) served as the primary outcome. Secondary outcomes included total tramadol consumption within 24 hours, the incidence of adverse effects such as nausea and vomiting, and patient recovery scores evaluated using the QoR-15 questionnaire.

Sample Size and Statistical Analysis

Statistical evaluations were carried out using SPSS version 25.0. The distribution of continuous variables was assessed for normality using the Kolmogorov–Smirnov test in conjunction with histogram visualization. Continuous variables with a normal distribution were expressed as mean ± standard deviation (SD), whereas those not normally distributed were summarized as median (minimum–maximum). Categorical variables were reported as counts and percentages (%).

Group comparisons were performed using the independent samples *t*-test for continuous variables with a normal distribution, the Mann–Whitney *U*-test for non-normally distributed variables, and the Chi-square test for categorical variables. A p-value of less than 0.05 was considered indicative of statistical significance.

As this study was designed as an exploratory pilot randomized controlled trial, no formal hypothesis-driven sample size calculation was performed to establish definitive efficacy. Due to the absence of prior randomized controlled trials directly comparing M-TAPA and TAP blocks in patients undergoing laparoscopic appendectomy, a reliable and conservative effect size estimate was not available. Therefore, the sample size was determined pragmatically based on feasibility considerations, anticipated recruitment capacity, and the predefined study period of two months. The primary feasibility objectives were to successfully implement the randomized study design, recruit a target sample of 30 patients (15 per group) within the study timeframe, and achieve complete postoperative follow-up during the first 24 hours. The data obtained from this pilot study were intended to provide preliminary estimates of effect size, variability, and feasibility parameters to inform the design of future adequately powered randomized controlled trials.

Results

A total of 30 patients were included in the study and, following randomization, assigned to either the TAP group (n = 15) or the M-TAPA group (n = 15). All patients completed the study protocol and were included in the analyses (Figure 1).

Both groups were well-matched in terms of demographic parameters and baseline clinical features. No statistically significant differences were detected among the groups in terms of age, sex, body mass index (BMI), or ASA physical status (all $p > 0.05$) (Table 1).

Resting and dynamic NRS scores were measured postoperatively at 1, 6, 12, 18, and 24 hours, with no statistically significant differences observed between the two groups at any assessment (all $p > 0.05$). In both groups, NRS scores gradually decreased over time. For instance, at 1 hour postoperatively, the median resting NRS score was 3 (2–4) in both the TAP and M-TAPA groups, while at 24 hours, the score had decreased to 1 (1–1) in both groups. Similarly, dynamic NRS scores were approximately 4 (3–5) at 1 hour and decreased to 2 (2–2) at 24 hours in both groups (Table 1).

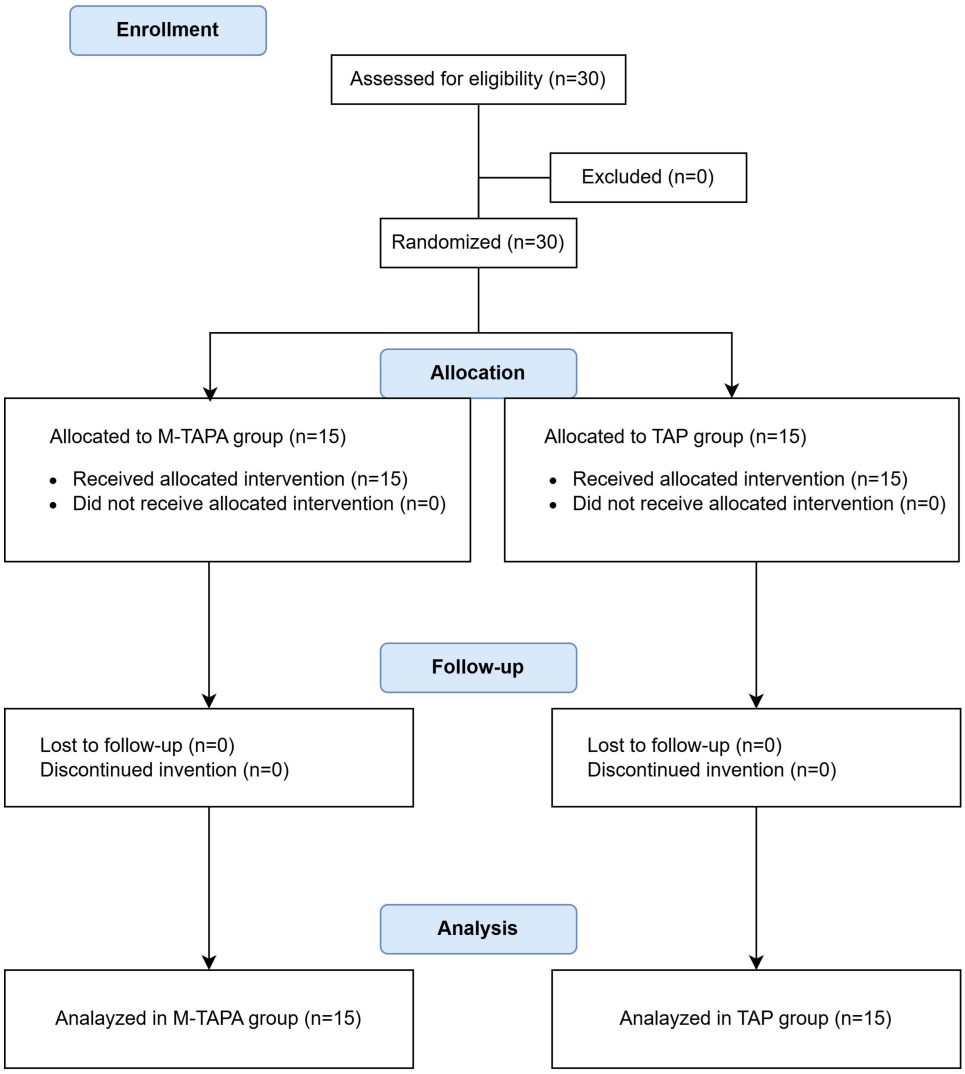

Figure 1 Flow diagram of the patients' recruitment.

Tramadol consumption within the first 24 hours was 50 mg (0–50) in both groups. Rescue analgesia was required by nine patients in each group, all of whom received a single 50 mg dose. Because all administered doses were fixed at 50 mg, no between-group statistical comparison was applicable.

No statistically significant difference was detected between the groups in postoperative recovery quality assessed by the QoR-15 questionnaire, with median scores of 138 (135–143) in the TAP group and 139 (136–145) in the M-TAPA group ($p = 0.51$).

No block-related complications, such as vascular puncture, local anesthetic toxicity, or hematoma, were observed during the study. Additionally, no patients experienced postoperative nausea, vomiting, sedation, or respiratory depression.

Discussion

In this exploratory pilot randomized controlled study, no statistically significant difference was detected between the M-TAPA and the TAP block with respect to postoperative pain intensity, opioid consumption, or quality of recovery following laparoscopic appendectomy. These findings indicate that, within the limits of this study, M-TAPA did not demonstrate superiority over TAP block for postoperative analgesia.

https://doi.org/10.2147/JPR.S575244

Table 1 Demographic Characteristics and Postoperative Outcomes of Patients Undergoing Laparoscopic Appendectomy

	Group TAP		Group M-TAPA		p
	Mean±SD	**Med (Min-Max)**	**Mean±SD**	**Med (Min-Max)**	
Age (year)	13.38±13.38	30(19–64)	32.6±13.22	31(18–62)	0.97
BMI (kg/m^2)	26.96±5.28	26.1(21.7–38.1)	26.16±5.79	26.1(18–40)	0.68
$NRS1^{st}$	3±0.85	3(2–4)	3.14±0.84	3(2–4)	0.68
$NRS1^{dyn}$	4±0.85	4(3–5)	4.14±0.84	4(3–5)	0.68
$NRS6^{st}$	2.4±0.64	2(2–4)	2.2±0.42	2(2–3)	0.51
$NRS6^{dyn}$	3.4±0.64	3(3–5)	3.2±0.42	3(3–4)	0.51
$NRS12^{st}$	2.07±0.97	2(1–4)	1.6±0.51	2(1–2)	0.25
$NRS12^{dyn}$	3.07±0.97	3(2–5)	2.6±0.51	3(2–3)	0.25
$NRS18^{st}$	1.54±0.52	2(1–2)	1.27±0.46	1(1–2)	0.22
$NRS18^{dyn}$	2.54±0.52	3(2–3)	2.27±0.46	2(2–3)	0.22
$NRS24^{st}$	1.14±0.36	1(1–2)	1±0	1(1–1)	0.54
$NRS24^{dyn}$	2.14±0.36	2(2–3)	2±0	2(2–2)	0.54
Tramadol consumption(mg)	-	50(0–50)	-	50(0–50)	-
QoR-15	138.74±2.79	138(135–143)	139.54±3.23	139(136–145)	0.51
Gender n (%)	Male 10 (66.7%)		Male 10 (66.7%)		1.00
	Female 5 (33.3%)		Female 5 (33.3%)		

Notes: Data are presented as mean ± SD and median (minimum–maximum) or n (%), as appropriate. Group comparisons were performed using the Mann–Whitney *U*-test for continuous/ordinal variables and the Chi-square test for categorical variables. No statistical comparison was performed for tramadol consumption because all administered rescue doses were fixed at 50 mg.

Both regional anesthesia techniques were safely incorporated into a multimodal analgesia regimen and were associated with low postoperative pain scores and minimal opioid requirements. However, given the exploratory nature of the study, the relatively small sample size, and the potential ceiling effect related to the concurrent use of systemic analgesics, the absence of statistically significant differences should be interpreted with caution.

Postoperative pain following laparoscopic appendectomy arises not only from parietal and visceral peritoneal stimuli caused by appendicitis but also from surgical trauma and factors related to pneumoperitoneum.[16] In our study, patients underwent procedures involving three surgical incisions (Figure 2). In the standard three-port technique, the optic port is typically placed at the umbilical region (T10 dermatome), while the assistant ports are usually positioned at the suprapubic midline (T12–L1 dermatomes) and the left lower quadrant or lateral region (approximately T11–T12 dermatomes).

Effective postoperative pain control is critically important, as insufficient analgesia or opioid-related adverse effects can negatively impact surgical recovery. Regional anesthesia techniques contribute to the postoperative recovery process by providing reliable analgesia and reducing opioid requirements, which has led to their increasingly widespread use in abdominal surgery.[17]

Acute appendicitis ranges from uncomplicated to complicated forms, such as gangrenous or perforated appendicitis with peritonitis, which has important implications for postoperative analgesia.[18] In uncomplicated cases, postoperative pain is predominantly somatic, and abdominal wall blocks such as TAP and M-TAPA are generally effective.[7,19,20] In contrast, complicated appendicitis is associated with greater inflammatory burden and visceral pain, resulting in higher

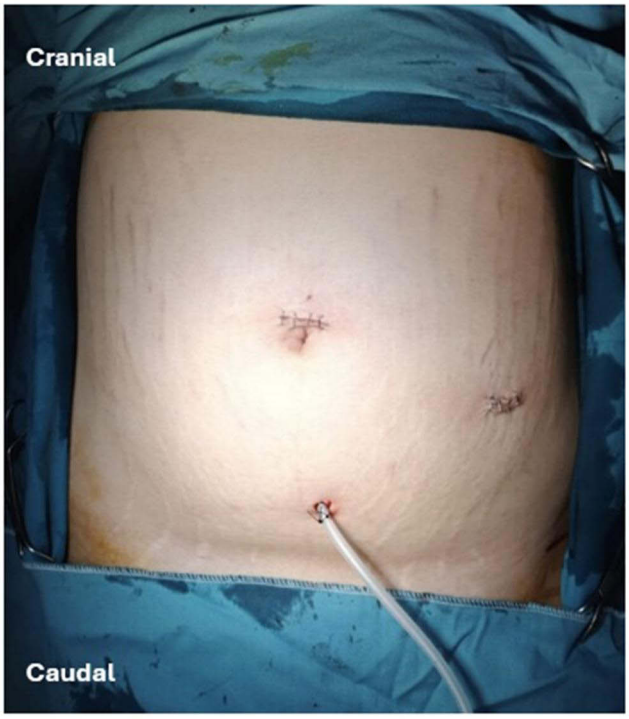

Figure 2 The patient's surgical incisions.

postoperative pain scores and opioid requirements.[18,21–23] Accordingly, while fascial plane blocks provide effective opioid-sparing analgesia in uncomplicated appendicitis, patients with complicated disease may require a more comprehensive multimodal analgesic approach.[24,25]

To ensure standardization of surgical trauma and postoperative pain characteristics, patients with complicated appendicitis and those requiring conversion to open surgery were excluded; therefore, the findings are primarily applicable to patients undergoing uncomplicated laparoscopic appendectomy and may not be generalizable to cases with higher disease severity or more complex surgical procedures.

While laparoscopic appendectomy represents a minimally invasive surgical approach, patients often experience moderate to severe postoperative pain in the first 24 to 72 hours.[16,26,27] Effective pain management is critical to enhance patient comfort, prevent respiratory complications, and facilitate early discharge.[16,27] Postoperative analgesia after laparoscopic appendectomy is typically planned around multimodal strategies aimed at minimizing opioid-related adverse effects.[7] While paracetamol and NSAIDs are routinely administered, opioids are generally reserved for rescue analgesia.[4] Adjunctive measures such as ketamine, local anesthetic infiltration, and intraperitoneal applications can improve pain control, whereas spinal or epidural anesthesia provides a safe and effective alternative.[4] To further reduce opioid requirements, peripheral nerve blocks, including TAP, oblique subcostal TAP, M-TAPA, and quadratus lumborum (QLB) blocks, have demonstrated efficacy in postoperative analgesia and contribute to a decreased need for opioids.[6–9]

The M-TAPA block, as defined by Tulgar et al[10] in 2019, is an interfascial plane block involving the injection of local anesthetic beneath the costal cartilage and deep to the origin of the transversus abdominis muscle. This spread is achieved through the cranial diffusion of the local anesthetic without being impeded by thick fascial barriers such as the linea semilunaris. By blocking the anterior and lateral cutaneous branches of the T5–T12/L1 thoracoabdominal nerves, this technique provides widespread analgesia across the abdominal wall.[11,12,28] Unlike M-TAPA, the TAP block targets T6–L1 afferent nerves by administering local anesthetic into the interfascial plane between the internal oblique and transversus abdominis muscles.[14,15] In a study comparing postoperative pain scores and analgesic efficacy among TAP, M-TAPA, and control groups in patients undergoing total abdominal hysterectomy with bilateral salpingo-oophorectomy through a Pfannenstiel incision involving the T12–L1 dermatomes, both M-TAPA and TAP blocks

 https://doi.org/10.2147/JPR.S575244

were found to provide more effective analgesia compared to the control group, while no significant difference was observed between the two block techniques.[29] Considering the typical port placements for laparoscopic appendectomy (T10, T12, and L1 dermatomes), both blocks are anatomically well positioned to target the somatic pain–generating regions of the anterior abdominal wall.

Despite reports from cadaveric studies[11] suggesting that the M-TAPA block may achieve a wider cephalocaudal spread, the present study did not detect statistically significant differences between M-TAPA and TAP blocks in terms of postoperative NRS scores, QoR-15 outcomes, or opioid consumption. Within the context of a multimodal analgesia regimen, both techniques were associated with low postoperative pain scores and limited opioid requirements. Furthermore, the absence of statistically significant differences in QoR-15 scores suggests that postoperative recovery outcomes did not differ between the two groups. These results suggest that, under the conditions of the present study, neither technique demonstrated superiority with respect to postoperative pain or recovery outcomes.

The absence of a statistically significant difference in opioid consumption between the two groups suggests that neither block demonstrated superiority in reducing postoperative opioid requirements. Limiting opioid administration may reduce the incidence of opioid-related adverse effects, such as postoperative nausea, vomiting, and sedation.[5,8,28] Previous studies have reported that M-TAPA was associated with reduced opioid consumption and a lower incidence of nausea and vomiting compared with control groups in various abdominal surgical procedures.[26,27] Within the context of a standardized multimodal analgesia regimen, the low opioid consumption and NRS scores observed in the present study indicate that both techniques were associated with satisfactory postoperative pain control.

Both the TAP and M-TAPA blocks are considered safe regional analgesic techniques; however, interfascial plane blocks may be associated with procedure-related complications. Potential risks common to both techniques include local anesthetic systemic toxicity, hematoma, infection, inadvertent peritoneal puncture, and visceral organ injury.[30,31] In addition, complications reported for the TAP block include transient femoral nerve palsy due to unintended local anesthetic spread.[32–34] Although the M-TAPA block is performed in proximity to thoracic structures, serious complications such as pleural puncture or pneumothorax have not been reported in the clinical literature and remain theoretical based on anatomical considerations.[10,30,31] In addition the TAP block is frequently preferred due to its extensive clinical experience and the relative ease of ultrasound-guided application.[5,6] On the other hand, the M-TAPA block has also been reported as an easily performed technique owing to its superficial anatomical location, the readily identifiable 10th costochondral junction, and simple needle visualization.[35]

This study has several limitations that should be acknowledged. First, the relatively small sample size limits the statistical power of the trial and may restrict the generalizability of the findings, increasing the risk of a type II error. Second, the analgesic efficacy of interfascial plane blocks is influenced by the volume and concentration of local anesthetic administered; therefore, the selected dosing regimen may have affected the observed outcomes.[5,11,36] Confidence intervals for between-group differences were not reported, which limits the precision of effect size estimation and should be considered when interpreting the findings. Although randomization and blinding of outcome assessors were implemented to minimize selection and detection bias, performance bias related to the inherent characteristics of regional anesthesia techniques cannot be entirely excluded. In addition, as the study compared only two active regional analgesic techniques without a non-block control group, the absolute analgesic benefit of either block relative to systemic analgesia could not be determined. The absence of preoperative baseline NRS and QoR-15 assessments further limits the ability to evaluate postoperative recovery relative to individual baseline status. Moreover, no formal dermatomal sensory mapping was performed, precluding definitive conclusions regarding the proposed wider dermatomal coverage of the M-TAPA block suggested by anatomical and cadaveric studies. Finally, postoperative follow-up was limited to the first 24 hours, providing no information on intermediate or late postoperative pain outcomes. Given that M-TAPA is a relatively novel technique, larger, adequately powered randomized trials incorporating dermatomal assessment and longer follow-up periods are required to more comprehensively evaluate its comparative analgesic profile across different surgical procedures.

Conclusion

In this exploratory pilot randomized controlled study, no statistically significant difference was detected between the M-TAPA and TAP blocks with respect to postoperative pain intensity, opioid consumption, or quality of recovery following laparoscopic appendectomy. Within the context of a standardized multimodal analgesia regimen, both techniques were associated with low postoperative pain scores and limited opioid requirements.

Abbreviations

ASA, American Society of Anesthesiologists; BMI, Body Mass Index; cmH_2O, Centimeters of Water; g, Gram; kg, Kilogram; LA, Local Anesthetic; L, Liter; mL, Milliliter; mg, Milligram; MHz, Megahertz; min, Minute; mm, Millimeter; mmHg, Millimeters of Mercury; µg, Micrograms; M-TAPA, Modified Thoracoabdominal Nerve Block Through the Perichondrial Approach; NRS, Numeric Rating Scale; NSAIDs, Nonsteroidal Anti-inflammatory Drugs; PEEP, Positive End-Expiratory Pressure; QLB, Quadratus Lumborum Block; QoR-15, Quality of Recovery-15; SD, Standard Deviation; SPSS, Statistical Package for the Social Sciences; TAP, Transversus Abdominis Plane.

Data Sharing Statement

Raw data (de-identified) used in this clinical trial are available from the corresponding author Fatih Balcı.

Ethics Approval and Informed Consent

This study was approved by the Local Ethics Committee of Sivas Cumhuriyet University (Date: June 6, 2023; Approval No: 2023-06/05). All participants were informed verbally and in writing about the study procedures and block interventions, and written informed consent was obtained thereafter. The study was registered at ClinicalTrials.gov with the identifier NCT06483581. This study was conducted in accordance with the principles of the Declaration of Helsinki.

Disclosure

The authors report no conflicts of interest in this work.

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