Original Research Article

EFFICACY OF MODIFIED THORACOABDOMINAL NERVE BLOCK THROUGH PERICHONDRIAL APPROACH (M-TAPA) FOR POSTOPERATIVE PAIN RELIEF IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY- A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Modified thoracoabdominal nerve block through the perichondrial approach (M-TAPA) is a novel block. In this block, the local anesthetic (LA) spread is not inhibited by the linea semilunaris, as seen in the case of the transversus abdominis plane block. Limited literature is available about the extent and duration of analgesia to date. Hence, we planned the present study to evaluate the efficacy of M-TAPA in providing postoperative analgesia in laparoscopic cholecystectomy (LC).

Materials & Methods: In this prospective randomized controlled trial, thirty adult patients scheduled for laparoscopic cholecystectomy were randomly allocated to Group M (M-TAPA block) and Group N (no block). The primary objective of the study was to evaluate the efficacy of the M-TAPA block in reducing the analgesic consumption in the initial 24 postoperative hours. Secondary objectives were to assess the effect of the block on pain scores in the first postoperative 24 hours, the time to make the first rescue analgesic request, intraoperative fentanyl consumption, and the number of dermatomes anesthetized.

Results: Thirty patients were analyzed.In Group M, significantly lower pain scores during the initial four postoperative hours, along with a prolongation of the time for first rescue analgesia (308.33 ± 64.69 vs 13.93 ± 4.11 min, $p<0.0001$),and lower analgesic requirements were recorded. The T8-T10 dermatomes were uniformly blocked in all patients bilaterally for the first 24 hours. A considerable number of patients exhibited both cranial (T6-T7) and caudal (T11-T12) sensory blockade in both anterior and lateral cutaneous branches. Regression of the caudal spread and complete disappearance of the cranial spread were noted at 24 hours.

Conclusion:M-TAPA block provides uniform sensory blockade of both anterior and lateral cutaneous branches in T8-T10 dermatomes. This approach was found to be effective in reducing postoperative analgesic consumption in patients undergoing LC.

Key words: Laparoscopic cholecystectomy, Ultrasonography, Postoperative Pain, Nerve block, Modified thoracoabdominal nerve Block through the Perichondrial Approach.

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INTRODUCTION

Laparoscopic cholecystectomy (LC), although a minimally invasive surgical technique, is frequently followed by postoperative pain of moderate to severe intensity.[1] Post-LC pain has several components, with somatic pain from the port site incision contributing the most (50-70%).[2] Regional anesthesia is an important part of multimodal analgesia; however, each option has its own shortcomings.[3] Epidural anesthesia can cause hypotension, urinary retention, and motor block, while paravertebral block requires a sitting or lateral position, and has a considerable risk of pneumothorax and accidental epidural puncture.[4] The serratus

intercostal plane block (SIPB) provides inadequate blockage in the midline, and the transverse abdominis plane (TAP) block provides blockage in T10 -L1 dermatomes only. The oblique subcostal TAP block (OSTAP block) does not effectively block lateral cutaneous branches of intercostal nerves. Erector spinae block requires a sitting, lateral, or prone position; this block also has a relatively higher risk of patchy block. Thoracoabdominal nerve block via the perichondrial approach (TAPA) requires a double injection in which local anesthetic (LA) is injected into the lower and upper aspects of the chondrium.[5]
Modified TAPA (M-TAPA) is a novel block in which the LA is administered between the
chondrium, and the origin of abdominal muscles with a single puncture, and the spread of LA is not inhibited by the linea semilunaris, as seen in the case of TAP block.[6] Limited literature is available on the extent and duration of analgesia to date.[7-9]The present study evaluated the efficacy of the M-TAPA block in reducing analgesic consumption in the initial 24 postoperative hours.

MATERIALS AND METHODS

Study design and ethical considerations: The present prospective, comparative, randomized study was conducted in a tertiary care hospital from February 2024 to August 2024, and it was approved by the institutional biomedical research ethics committee (EC/NEW/INST/2022/HR/0189) via letter number BREC/23/TH-Anaesthesia/37 and registered with the Clinical Trial Registry of India (CTRI/2024/02/062488). Written informed consent was obtained from all the patients.

Participants

Thirty adult patients aged 18-65 years, both male and female, with American Society of Anesthesiologists (ASA) physical status 1 or 2 scheduled to undergo LC under general anesthesia (GA) were included. Patients with coagulopathies, allergic reactions to LA, block site infections, pregnancy, history of trauma or surgery of the abdomen, weight <50 kg, or body mass index (BMI) > 30 kg/m2, were not included.

Randomization and blinding

All patients were evaluated one day before surgery, and demographic data were recorded. Tablet alprazolam 0.25 mg was given for premedication the night before and in the morning of surgery. After enrollment by the principle investigator, the patients were allocated randomly by a computer-generated sequence without their awareness into one of the two groups of 15 patients each, using block randomization and allocating them by one of the investigators in a ratio of 1:1, with a block size of four and sealed envelope system. The person conducting randomization was further not involved in the study process. The person performing block assessment (single assessor) was also not involved during the randomization and block procedure.

Interventions

In the operating room, standard monitors were attached, and IV fluid infusion was started. After preoxygenation, fentanyl 2 µg kg -1, propofol 1-2 mg kg -1 in titrated doses until the loss of verbal response, and atracurium 0.5 mg kg -1 for muscle relaxation were given. After 3 minutes, endotracheal intubation was performed, and controlled ventilation using 66% N2O with O2 and sevoflurane was used to maintain balanced anesthesia.

In Group M (n=15), after the induction of GA and before the start of surgery, the M-TAPA block was administered on both sides by an experienced anesthesiologist using a linear transducer probe (6 to 13 MHz) of the Sonosite Edge-II ultrasound (USG) machine. With the patient lying supine, the transducer was placed at the costochondral junction on the 10th rib margin in the sagittal plane in the midclavicular line and then advanced to view the lower side of the chondrium. A needle was inserted until its tip rested below the posterior aspect of the10th costal cartilage (Figure1).Bupivacaine (20 ml of 0.25%) was injected (after negative aspiration and confirming the location via hydrodissection with 0.5 ml saline) at the lower surface of the 10th rib, at the origin of the abdominal muscles. In Group N (n=15), no block was administered. Block performance time was recorded. The surgery was performed using the four-trocar technique with two trocars in the midline, just above the umbilicus and below the xiphoid, and the other two in right subcostal area at the midclavicular and anterior axillary lines.

Objectives

The present study primarily evaluated the efficacy of the M-TAPA block in reducing the analgesic consumption during the initial 24 postoperative hours. The secondary objectives of the study were to assess the effect of the block on pain score in the initial 24 hours postoperatively, the time to first rescue analgesic request, intraoperative fentanyl consumption, and the number of dermatomes anesthetized.

Perioperative monitoring and outcome measurement

Throughout the surgery, the intra-abdominal pressure was maintained between 12 and 14 mmHg and the end-tidal CO2 was 35 to 40 mm Hg. Intravenous fentanyl (0.5µg kg -1 increments) was given if HR and MAP (mean blood pressure) increased by 20% or more from baseline despite maintaining the adequate minimum alveolar concentration (MAC) of 1-1.2. All the patients were given intravenous ondansetron (4 mg) to prevent postoperative nausea and vomiting 15-30 minutes before completion of surgery. Upon completion of surgery, the patient was extubated and sent to the post-anesthesia care unit (PACU). LA infiltration at surgical sites (intraperitoneal/portsite) or any other regional block was not administered. Pain assessment was conducted postoperatively using the visual analogue scale (VAS) (0-no pain, 10-

intolerable pain) at PACU admission, and at 2, 4, 6, and 24 hours as well as at the time of first rescue analgesia. The time to first rescue analgesic requirement (from extubation time to postoperative time when the patient reported a pain score of VAS ≥ 4 at rest) was noted. Rescue analgesic [IV paracetamol (PCM) maximum dose 1 g every eight hours] was given at VAS score ≥ 4. If pain persisted after PCM administration, IV tramadol (maximum 100 mg every eight hours) was administered, and total analgesic consumption in 24 hours was recorded. The level of dermatomal block from T4-L1 was assessed using pinprick in anterior (3-5 cm lateral from midline) and lateral cutaneous branches (at the midaxillary line) on both sides at the 2nd and 24th postoperative hours. Any adverse effects were recorded and managed accordingly.

Sample size calculation and statistical analysis

The size of sample was calculated using the formula for mean and SD derived from median and range, based on the results of a study in which analgesia requirement [median (IQR)] for the first 24 hours in the M-TAPA Group was 100 (0–200) and in the control group was 200 (100–300) mg. [7] The formula for mean and SD using median and range is: $\bar{x}$=(a+2m+b)/4, SD=square root of 1/12[(a-2m+b)2/4+(b-a)2], where m is the median, a is the minimum value and b is the maximum value.[10] With reference to these values, the minimal sample size with 95% power of study and 5% level of significance was 9 patients in each group. However, a total sample size of 30 (15 patients per group) was selected.

Categorical variables were expressed in percentage (%) form and compared using the chi-square test or Fisher's exact test. The quantitative data were presented as the means ± SD or medians with interquartile range (IQR) and compared using the independent t test and the Mann-Whitney test. For repeated measures of pain intensity (VAS scores), a Linear Mixed-Effects Model (LMM) was applied with Group, Time, and Group×Time interaction as fixed effects, and a random intercept for each subject to account for within-subject correlations. Estimated mean differences, 95% confidence intervals (CIs), and multiplicity-adjusted p-values (False Discovery Rate correction) were computed. Additionally, area under the curve (AUC) values for pain scores were calculated for 0–6 hours and 2–24 hours and compared between groups using Welch's t-test. The dose of tramadol (0–24 hours) was compared using Welch's two-sample t-test, with results expressed as mean difference, 95% CI, and Hedges' g (bias-corrected Cohen's d) to assess effect size. The proportion of dermatomes blocked and corresponding 95% CIs were estimated using Wilson's method. Kaplan–Meier survival analysis was conducted to compare the time to first rescue analgesia between groups, and differences were tested using the log-rank test. Additionally, a univariate Cox proportional hazards regression model was applied to quantify the effect of group on the time to first rescue analgesia, reporting beta coefficients, hazard ratios, 95% CIs, and p-values. Statistical Package software from IBM manufacturer, Chicago, version 25.0, was used. Value of$p<0.05$ was considered statistically significant.

RESULTS

Thirty-five patients were assessed for eligibility and three were excluded due to different exclusion criteria. Out of the 32 patients enrolled, two were excluded from analysis due to conversion to open cholecystectomy in one and drain insertion in the other [Figure 2], No protocol deviation or missing data were found during the trial period. Both the groups had similar demographic characteristics and were comparable (Table 1). Four patients (26.67%) in group M and three (20%) in group N were overweight, with a BMI between 25 and 29.99 kg/m2 ($p = 1$). The mean of additional fentanyl consumption intraoperatively was significantly higher in Group N (0.93 ± 0.32 μ kg -1) as compared to Group M (0.17 ± 0.31 μ kg -1), showing the analgesic sparing effect of the M-TAPA block.

The VAS scores [median (IQR) showed significantly lower values in group M compared to group N in the initial postoperative 4 hours ($p < 0.0001$). Thereafter no significant difference was observed at six and 24 hours (Table 2). Linear Mixed-Effects Model (LMM) was applied to VAS scores with Group, Time, and Group×Time interaction as fixed effects [Table 2]. The positive values show higher VAS scores in Group N compared to Group M. A False Discovery Rate-adjusted p value < 0.05 indicates a significant difference between groups at that particular time. AUC values for pain scores from 0–6 hours and 2–24 hours show lower AUC in Group M compared to Group N ($p < 0.0001$) which reflects lower pain intensity or improved pain control over time. [Table 2]

In the first 24 hours postoperatively, PCM and tramadol consumption were higher in group N compared to group M ($p <0.0001$). In group M, one patient required PCM once, ten patients twice and only four patients needed it thrice, while all the patients in group N received PCM thrice in postoperative 24 hours.Similarly, tramadol consumption was lower in group M (only four patients required 100 mg tramadol), while in group N, four patient received 100 mg, nine patients 200 mg and two patients needed 300 mg tramadol respectively. Table 3 shows the comparison of total opioid consumption between the groups[$p<0.0001$].In the group variable analysis the hazard ratio for group N was 266.12 (95% CI: 2.45–28892.33), indicating that patients in group N had a 266-fold higher risk of requiring rescue analgesia earlier compared to group M (Table 4). Kaplan meier survival analysis curve showed that at the end of 20 minutes, 100% of patients in group N, as compared to only 6.67% of patients in group M required rescue analgesia. By 240

minutes, 80% of patients in group M required rescue analgesia, while none remained pain-free in group N [Figure 3]. The mean time to first rescue analgesia was markedly higher in group M (308.33 ± 16.70 minutes; 95% CI: 275.60–341.07) compared to group N (13.93 ± 1.06 minutes; 95% CI: 11.85–16.02). Similarly, the median time was longer in group M (330 minutes; 95% CI: 241.64–418.37) compared to group N (14 minutes; 95% CI: 10.21–17.79). The incidence of complications like nausea (two patients in group M and six in group N) and vomiting (one patient in group M and three patients in group N) was low and comparable in both groups. The mean time to perform the M-TAPA block was 4.47 ± 0.96 min.

T8-T10 dermatomes were uniformly blocked in all patients bilaterally for the first 24 hours postoperatively [Table 5]. At 2 hours postoperatively, an upward sensory blockade (T6-T7) was seen in a considerable number of patients in both the anterior (left side in 11 patients and right side in 12 patients) and the lateral cutaneous branches (on left side in 13 patients and right side in 12 patients). This sensory blockade faded in 24 hours postoperatively, as no patient showed dermatomal blockade of T6-T7 dermatomes at that time. Sensory blockade was also seen in lower dermatomes (T11-T12) in the anterior (on left side in 10 patients and right side in 12 patients) and in the lateral cutaneous branch (on left side in 13 patients, and right side in 11 patients). At postoperative 24 hours, lower (T11-12) sensory blockade remained in three patients on the left side, and four patients on the right side (in the anterior cutaneous branch), and six patients on the left side, and four patients on the right side (in the lateral cutaneous branch) respectively. In the Heat map of sensory block distribution, values closer to 100% indicate better spread of sensory block and overlapping high values across both anterior and lateral branches demonstrate consistent and effective dermatomal coverage [Figure 4].

Table 1: Demographic parameters of the study population

Parameter	Group M (n=15)	Group N (n=15)	Test	p value
Age (years) mean±SD	38.93 ± 12.27	43.6 ± 12.12	Independent t test	0.304#
Gender Male:Femalen(%)	6:9 (40:60)	8:7 (53.33: 46.67)	$\chi 2$	0.464#
Height (cm) mean±SD	166.4 ± 5.55	166.2 ± 5.72	t test	0.923#
Weight (Kg) mean±SD	66.33 ± 4.72	66.53 ± 4.6	t test	0.907#
BMI (kg/m²) mean±SD	23.99 ± 1.63	24.05 ± 1.41	t test	0.915#
ASA grade 1:2n(%)	10:5 (66.67:33.33)	10:5 (66.67:33.33)	$\chi 2$	1#
Duration of surgery (min) mean±SD	72.67 ± 11.78	76 ± 9.67	t test	0.404#

#: statistically non-significant, t test: independent t test, χ2: Chi square test, BMI: body mass index, ASA: American society of anesthesiologist

Table 2. Linear Mixed-effects Model for VAS scores: Group Differences at Each Time Point & Comparison of AUC Values

Time	Group M (n=15) (observed mean±SD)	Group N(n=15) (observed mean±SD)	Cohens d	P value	Mean DifferenceGroup M to N	95% CI	P adjusted FDR
0.0	3.0±0.0	6.6±0.737	6.91	<.0001*	3.108	2.544-3.672	<.0001*
2.0	2.533±0.516	3.933±1.033	1.715	<.0001*	2.049	1.697-2.401	<.0001*
4.0	3.367±0.809	4.267±0.944	1.024	<.0001*	0.99	0.664-1.315	<.0001*
6.0	4.267±0.594	4.533±0.743	0.396	0.791#	-0.069	-0.584-0.446	0.791#
AUC 0-6h	18.467±1.885	27.133±1.552	5.02	<.0001*	-	-	-
AUC 2-24h	12.933±1.751	16.6±1.404	2.31	<.0001*	-	-	-

*CI: confidence intervals, FDR: multiplicity-adjusted p-values (False Discovery Rate correction), #: statistically non-significant, *: statistically significant, AUC: area under the curve*

Table 3: Comparison of Tramadol consumption in postoperative 24 hours

Groups	Mean ±SD(mg)	Mean difference(Group N to M, 95%CI)	Welch t p value	Hedges' g effect size(95%CI)
Group M (n=15)	26.667±45.774	160(118.19-201.81)	<.0001*	2.798(1.77 to 3.82)
Group N (n=15)	186.667±63.994			

*SD: standard deviation, CI: confidence intervals, Welch t: Welch's two sample t-test, Hedges' g: bias corrected Cohen's d, *: statistically significant*

Table 4: Univariate cox proportion hazard regression to assess effect of group on time of first rescue analgesia

Group	Beta coefficient	Standard Error	P value	Hazards ratio	95% CI for hazards ratio	
					Lower	Upper
Group M				1.000		
Group N	5.584	2.392	.020*	266.115	2.451	28892.327

*CI: confidence intervals, *: statistically significant*

Table 5: Distribution of sensory dermatomal blockade in anterior and lateral cutaneous branches bilaterally

Dermatome	RIGHT				LEFT			
	Anterior branch		Lateral branch		Anterior branch		Lateral branch	
	2h	24h	2h	24h	2h	24h	2h	24h
	Proportion (95%CI)	Proportion (95%CI)	Proportion (95%CI)	Proportion (95%CI)	Proportion (95%CI)	Proportion (95%CI)	Proportion (95%CI)	Proportion (95%CI)
T6	80%(54.81-92.95)	0%(0-20.39)	80%(54.81-92.95)	0%(0-20.39)	73.33%(48.05-89.1)	0%(0-20.39)	86.67%(62.12-96.26)	0%(0-20.39)
T7	80%(54.81-92.95)	0%(0-20.39)	80%(54.81-92.95)	0%(0-20.39)	73.33%(48.05-89.1)	0%(0-20.39)	86.67%(62.12-96.26)	0%(0-20.39)
T8	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)
T9	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)
T10	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)	100%(79.61-100)
T11	80%(54.81-92.95)	26.67%(10.9-51.95)	73.33%(48.05-89.1)	26.67%(10.9-51.95)	66.67%(41.71-84.82)	20%(7.05-45.19)	86.67%(62.12-96.26)	40%(19.82-64.25)
T12	80%(54.81-92.95)	26.67%(10.9-51.95)	73.33%(48.05-89.1)	26.67%(10.9-51.95)	66.67%(41.71-84.82)	20%(7.05-45.19)	86.67%(62.12-96.26)	40%(19.82-64.25)

T: Thoracic dermatome, CI: confidence intervals

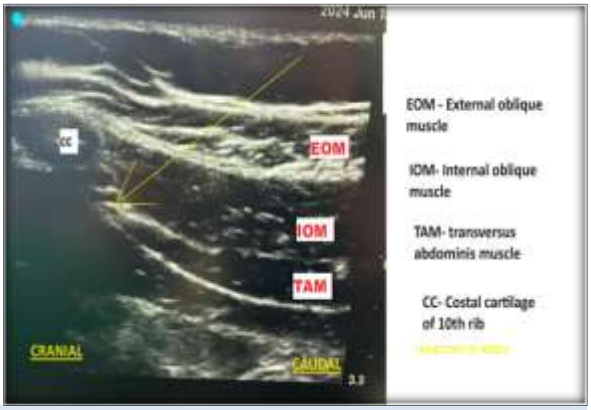

Figure 1: Ultrasound guided view of trajectory of needle and needle tip position for M-TAPA

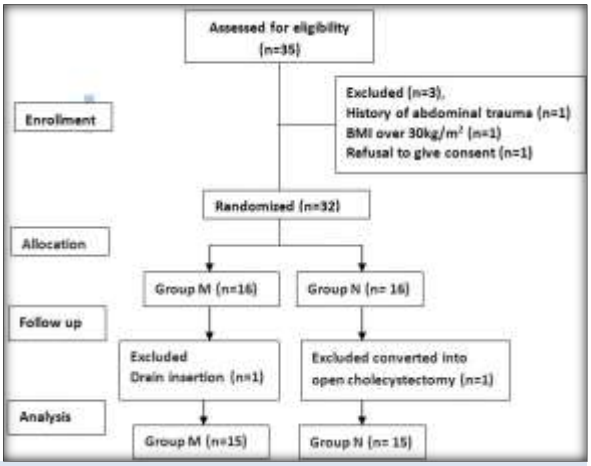

Figure 2: Consort diagram

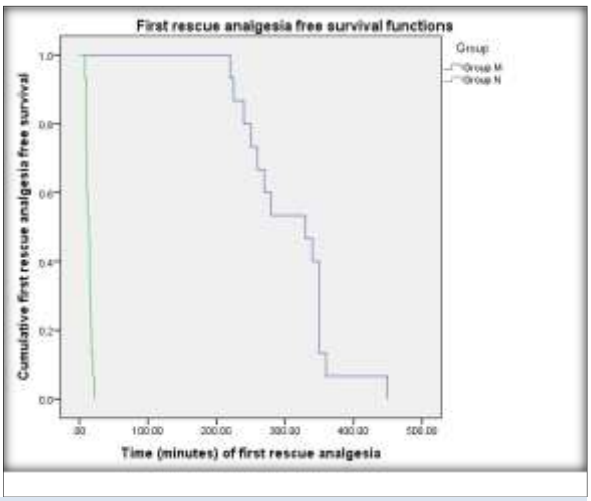

Figure 3: Kaplan meier survival analysis curve to compare requirement of first rescue analgesia between groups

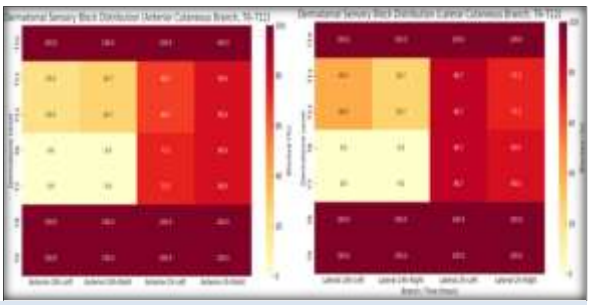

Figure 4: Heat map of dermatomal sensory block distribution (anterior and lateral cutaneous branches of T6-T12)

BMI: body mass index

DISCUSSION

The present study assessed the efficacy of M-TAPA in reducing analgesic consumption in the initial postoperative 24 hours [Table 3]. The reduced intraoperative additional fentanyl requirement and lower VAS scores [Table 2] during the early postoperative period, along with the prolonged time to first rescue analgesic request in group M demonstrate the efficacy of the M-TAPA block [Table 4, Figure 3]. Additionally, the persistent dermatomal block (Figure 4, Table 5) and decreased total analgesic consumption in the postoperative 24 hours [Table 3] indicate the adequate analgesic efficacy of the M-TAPA block in LC. Similar results were reported in a previous study in which significantly lower tramadol consumption was noted in M-TAPA group compared to the control group (100 mg vs. 200 mg) in the first 24 postoperative hours after LC.[7] The observations of the present study are in agreement with a study that analyzed the efficacy of postoperative analgesia by M-TAPA and local infiltration (LI) in LC, which found lower tramadol consumption in the M-TAPA group in the first 24 hours.[11-12] In another study that compared the analgesic efficacy of TAPA and M-TAPA in LC, the authors observed similar tramadol consumption in both groups for postoperative 12 hours. This study highlighted that both techniques provided adequate analgesia, with a slightly lower tramadol consumption observed in the TAPA group.[13]

VAS scores in the early postoperative period demonstrated superior pain control provided by the M-TAPA block [Table 2]. Similarly, authors who compared the M-TAPA with LI found that the resting pain scores were significantly reduced in the M-TAPA group until postoperative four hours, and a significant reduction in the pain scores on movement was observed in M-TAPA group until the first 16 hours in postoperative period ($p = 0.001$).[11] Another study also observed significantly lower VAS scores in the M-TAPA group compared to the LI group during rest and movement in the first 24 h postoperatively.[12] A study that compared TAPA and M-TAPA blocks found that pain scores were comparable at the third and sixth postoperative hours, indicating that both blocks were effective in managing pain. However, at the first and twelfth postoperative hours, pain scores were lower in the TAPA group, indicating that the TAPA block provided slightly better pain relief as compared to the M-TAPA block, which required two injections, both on the upper and lower aspects of the chondrium.[13]

Additional intraoperative fentanyl consumption was significantly reduced in Group M, showing the analgesia-sparing effect of the M-TAPA block. The reduced postoperative opioid use in Group M causes a lower incidence of nausea and vomiting. Similarly, other authors also found that the incidence of nausea and vomiting was significantly lower in the M-TAPA group compared to LI group.[11-12] A study that evaluated postoperative nausea and vomiting (PONV) scores using a verbal descriptive scale found no significant difference overall; however, a significantly lower score was observed at the 15th postoperative minute in the M-TAPA group.[7]

The relatively short time required for M-TAPA block administration highlights the practicality of the M-TAPA block in a busy surgical setting, especially given the long-lasting analgesic benefits that the block provides.[13] The mean surgical time did not increase significantly due to block administration. This reinforces the clinical viability of the block as an adjunct to general anesthesia without compromising operating room time or workflow.[7,11]

A detailed assessment of the sensory blockade showed T8-T10 dermatomes were uniformly blocked in all patients bilaterally for the first 24 hours. LA spread from T6 to T12 was seen in a good number of patients on both sides, but the upward effect disappeared completely, and the downward spread also faded at the 24th postoperative hour (Figure 4, Table 5). Similarly, another author observed that 25 ml of 0.25% bupivacaine in the M-TAPA block provided a downward sensory block (up to T10-11) in a considerable number of patients, along with a fair upward LA spread in the anterior branches and a slightly lesser cranial sensory block in the lateral branches.[9] In a study, authors evaluated both dermatomal blockade of M-TAPA in patients and dye spread in cadavers. They found that 25-30 ml of LA provided an anterior sensory block of 6-6.5 dermatomes at the 2ndand 24thpostoperative hours with limited caudal and lateral spread. In cadavers, T8-T11 spread of dye was recorded, and no additional benefit was seen on increasing the volume from 25 to 30ml.[14]

On the other hand, some authors found blockade of only the anterior cutaneous branches in M-TAPA block in healthy volunteers. According to the study, as the lateral thoracoabdominal nerves lie on the external oblique muscle, this anatomical course might account for the restricted sensory blockade of the lateral branches observed with the M-TAPA block.[15] But in a cadaveric study, extensive dye spread from T4 to T11–T12, including the undersurface of the upper part of the rectus muscle and external oblique muscle (T8-T10), on both surfaces of the internal oblique muscle, and over the costal margin was seen in the M-TAPA block.[16] These findings are in agreement with our study, where, although the sensory block was greater in anterior branches, a fair lateral sensory block was also seen, especially in T8-T10 dermatomes. Postoperative follow-up of all the patients for up to 24 hours and assessment of the dermatomal block level were the main strengths of the present study. According to a systematic review and Delphi study, dermatomal evaluation is a main outcome that should be assessed in any regional anesthesia research.[17]Furthermore, pain in the initial postoperative period is more significant; hence, pain

should be evaluated and actively managed for at least the first 24 hours.[18]

There are a few limitations in the present study. First, the sensory blockade was assessed in the postoperative period and previous studies have shown that sensory block range regresses over time.[19] Hence, our recorded sensory block levels in the postoperative period might be less than the actual extent achieved initially at the time of block administration. Secondly, the present study is a single-center study with a small population and only resting pain was assessed; results from a large sample across different centers with both resting and dynamic pain evaluation could provide more details about this novel block. However, the sample size in the study was much greater than the actual sample required according to the statistical calculations. Thirdly, the blinding of the observer/assessor was not possible due to the study design (no block used in control group); this might have resulted in observer bias in pain scores but since the dermatomal block is an objective outcome, it has not been affected by it.

CONCLUSION

Ultrasound-guided M-TAPA using 20 ml of 0.25% bupivacaine provides uniform sensory blockade of both anterior and lateral cutaneous branches in T8-T10 dermatomes, with both cranial T6-T7 and caudal T11-T12 spread in a good number of cases. It reduces postoperative analgesic consumption during the initial 24 postoperative hours in patients undergoing LC. It also delays the time to first rescue analgesic request and decreases the pain scores in initial postoperative hours. This block is easy to administer, as only a single injection is required on the undersurface of the 10^{th}chondrium and seems to be safe, as no complications were noted in the present study.

Ethical Approval & Registration: Ethical clearance obtained from Institutional Biomedical research ethics committee (EC/NEW/INST/2022/HR/0189) with registry number BREC/23/TH-Anaesthesia/37 dated 17th October 2023. The registration for study was done with Clinical Trials Registry-India with reference number CTRI/2024/02/062488 dated February 2024.

Data availability: On request data available from corresponding author.

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Conflicts of interest: No

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