

To Study the Analgesic Efficacy of Ultrasound-guided Transversus Abdominis Plane Block in Abdominal Oncosurgeries

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ABSTRACT

Background: Ultrasound-guided bilateral transversus abdominis plane (TAP) block provides analgesia by blocking the anterior abdominal wall afferent nerves. We evaluated the analgesic efficacy of TAP block as a component of multimodal analgesia in patients undergoing major abdominal oncosurgeries. The study design is prospective, randomized, and controlled.

Materials and methods: Sixty patients of 18–65 years of age of either sex and American Society of Anesthesiology (ASA) grade I, II, or III undergoing major abdominal oncosurgeries were randomized to the TAP group ($n = 30$) and the control group ($n = 30$). All patients received standard general anesthesia. In the TAP group patients after the completion of the surgery, ultrasound-guided 18G Braun Perifix epidural catheter was placed in TAP and 50 mg bupivacaine was given bilaterally 8 hourly up to 24 hours. In the control group patients, the TAP block was not performed. Patients of both groups received patient-controlled analgesia (PCA) with intravenous morphine and IV paracetamol 1 g 8 hourly. In the postoperative anesthesia care unit (PACU), we observed all patients visual analogue scale (VAS) pain score at rest and on knee flexion, PCA morphine demands, sedation score, and nausea/vomiting score at 0, 2, 4, 6, 12, 18, and 24 hours. The primary outcome measure was to study the VAS pain score in TAP and control group patients at rest and on knee flexion up to 24 hours. The secondary outcome measure was to calculate the PCA morphine requirement in both groups with 24 hours' time frame.

Results: Patients receiving TAP block with 0.25 % bupivacaine 20 mL eight hourly had reduced postoperative VAS pain score at rest and on knee flexion compared to the control group ($p < 0.05$). Up to 24 hours in PACU, IV morphine requirement in the TAP group was reduced to 19 mg as compared to 32 mg in the control group which is highly significant ($p < 0.001$).

Conclusion: Patients receiving TAP block had effective postoperative analgesia and decreased morphine requirement up to 24 hours; hence, TAP block should be considered as a major component of multimodal analgesia for pain management of major abdominal oncosurgeries. The study has been registered with www.clinicaltrials.gov ID NCT03165383.

Keywords: Pain score, Patient-controlled analgesia, Transverse abdominis plane block, Visual analogue scale.

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INTRODUCTION

Patients undergoing major abdominal surgeries experience significant postoperative pain. Effective postoperative pain control results in decreased cardiac, pulmonary and metabolic complications, improved patient satisfaction, and early mobilization.

These patients require a multimodal analgesia regimen that provides high-quality analgesia with minimal side effects. Morphine, delivered using a PCA device, remains the mainstay of postoperative analgesic regimens; however, the use of opioids can result in significant adverse effects, including respiratory depression, sedation, nausea and vomiting, and TAP block as a component of multimodal analgesia that reduces opioid-related side effects.¹⁴

The TAP block is a regional anesthetic technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall.¹ TAP block is a safe alternative to epidural analgesia in patients with coagulopathy, spine surgery, or hemodynamic instability. Rafi described depositing local anesthetic (LA) in the lumbar triangle of petit by the anatomical palpation method but as it is a blind technique, the possibility of damage to visceral organs exists.²

Real-time ultrasonography provides better identification of myofascial planes (Plane between the internal oblique muscle and the transversus abdominis muscle) and clear visualization of the

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needle; hence, it increases the success of the TAP block. The primary aim was to study the analgesic efficacy of the TAP block in reducing the VAS pain score at rest and on knee flexion in patients undergoing abdominal surgeries. The secondary outcome was to evaluate the total morphine requirement in both groups.

The sensorimotor innervation of the anterior abdominal wall is supplied by the anterior rami of the thoracolumbar spinal segmental nerves T7–L1.¹ These nerves course through transverse abdominis neurofascial plane (TAP) which lies between the internal oblique and the transverse abdominis muscle.⁴ We placed bilateral TAP catheters to prolong the effect of the TAP block with intermittent boluses of 20 mL 0.25% bupivacaine every 8 hourly.

MATERIALS AND METHODS

After approval by the institutional review board (RGCIRC/IRB/12/2013), this prospective, randomized, controlled study was registered in www.clinicaltrials.gov ID NCT03165383 dated 05/23/2017. After obtaining written informed consent from all enrolled participants, this study was conducted from 11/02/2013 to 20/08/2014 on 60 patients included American Society of Anesthesiology (ASA I–III), 18–65 years patients of either sex undergoing elective major abdominal oncosurgeries having a duration of ≥ 2 hours. Exclusion criteria included patient refusal, local infection at the TAP blocksite on the abdominal wall, coagulopathies, and allergic reaction to bupivacaine.

During preoperative evaluation, all patients were explained about the VAS pain score from 0 to 10 indicating mild to severe pain and to activate the demand button of PCA, Graseby 330 syringe pump if VAS pain score is more than 3 then rescue analgesic IV Morphine 1 mg will be delivered to decrease the pain with lockout interval of 10 minutes.

Patients were kept nil orally for 8 hours prior to surgery, they received tablet alprazolam 0.25 mg night prior to surgery, tablet ranitidine 150 mg, and tablet granisetron 2 mg 2 hours prior to surgery. In the operation theatre, IV access was established with 16 G cannula and 5 lead electrocardiogram (ECG), pulse oximetry (SpO₂), noninvasive blood pressure (NIBP) and end tidal carbon dioxide (ETCO₂) will be monitored. Anesthesia was induced with propofol 1–1.5 mg/kg⁻¹ and fentanyl 1–2 μ g/kg⁻¹ in titrated doses, and the intubation was facilitated with IV atracurium 0.5 mg/kg⁻¹. Anesthesia was maintained with 40% oxygen, 60% nitrous oxide, sevoflurane and intermittent boluses of fentanyl 20 μ g depending on the hemodynamic response, intermittent positive pressure ventilation (IPPV) volume-controlled mode with a tidal volume of 8 mL/kg⁻¹ on the Dragger Primus anesthesia machine. The respiratory rate was adjusted to maintain the end-tidal carbon dioxide levels at 35–40 mm Hg as measured by the capnograph.

After completion of the surgery, we performed bilateral ultrasound-guided TAP block and catheter placement in TAP group patients. Using a linear high-frequency ultrasound probe (6.0–13.0 MHz), 16 G Tuohy needle was placed in transverse abdominis plane and hydrodissection was performed with 5 mL 0.25% bupivacaine after negative aspiration, then the 18-gauge epidural catheter (Braun Perifix Catheter, B. Braun, Melsungen AG, Melsungen, Germany) was introduced through the Tuohy needle and the catheter was advanced 5–8 cm in the TAP to avoid accidental displacement. The point of insertion was between the lower costal margin and the iliac crest, and 5 mL of bupivacaine 2.5 mg/mL was injected via each catheter with direct real-time ultrasound visualization of the drug spread in the TAP Figure 1. The TAP catheters were fixed using self-adhesive fixation as shown in Figure 2. No TAP block was performed in the control group patients. An inhalational agent was titrated from closure of surgical wound to completion of TAP block to maintain the required depth of anesthesia. The trachea was extubated after reversal of neuromuscular blockade, adequate spontaneous breathing,

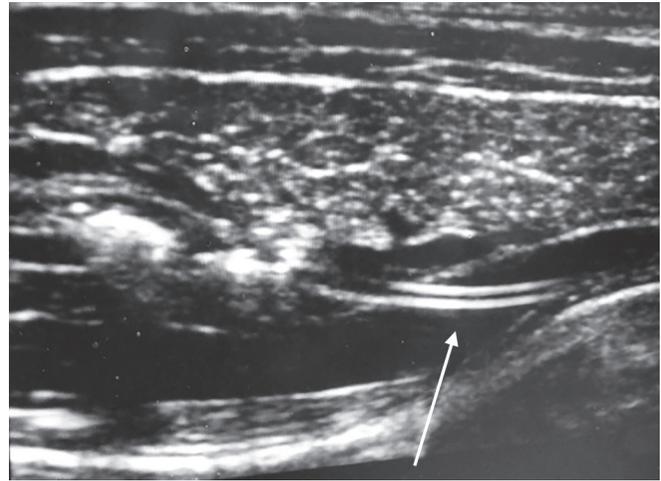


Fig. 1: LA deposited in TAP with catheter *in situ*

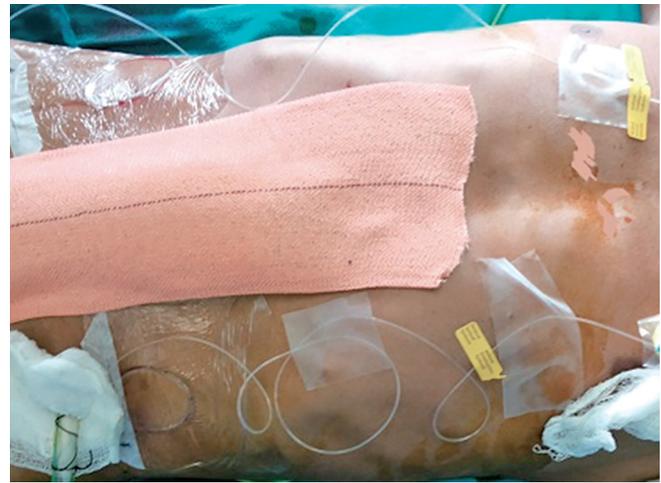


Fig. 2: Bilateral TAP block catheters fixed with adhesives

and conscious well-oriented patient. PCA with IV morphine concentration 1 mg/mL PCA bolus dose of 1 mg with a lockout period of 10 minutes was commenced postoperatively.

In the postoperative anaesthesia unit (PACU), 0.25% bupivacaine 20 mL was given 8 hourly bilaterally through the TAP catheter by an anesthesia resident doctor. Paracetamol 1 g iv was given to both groups 8 hourly. In PACU at 0 (T1), 2 (T2), 4 (T3), 6 (T4), 12 (T5), 18 (T6) and 24 (T7) hours, we observed HR, BP, VAS pain score at rest and knee flexion, total and good demands of morphine via the PCA pump. The total morphine consumption up to 24 hours, sedation score, nausea/vomiting score, and side effects namely itching was noted. The VAS pain score was noted by a caretaker blinded about the control and the study group.

Analgesia was assessed using a 0–10 cm VAS pain score, with 0–3 score indicating mild pain, 4–7 moderate, and more than 7 severe pain. All the data were statistically analyzed using the Statistical Package for the Social Sciences (SPSS) statistical software version 19.0. All continuous variables like heart rate, systolic and diastolic BP, and VAS pain score both at rest and coughing were compared with multivariate-repeated measurement analysis using the unpaired *t* test. The Chi-square test was performed for categorical variables such as sex ratio, ASA grades, age distribution, sedation score, and nausea/vomiting score. The Mann–Whitney test was used to determine the median and IQR of total and good

demands taken through a morphine PCA pump. Differences were considered statistically significant at $p < 0.05$, highly significant at $p < 0.01$, and very highly significant at $p < 0.001$. Results were expressed as mean \pm SD in the tabular form, bar, and line diagrams.

Patients were randomly allocated using the sealed envelope method into TAP group patients receiving the TAP block with the catheter placement ($n = 30$) and control group patients not receiving the TAP block ($n = 30$).

Sample Size Calculation

With the reference of a previous study, we assumed that the difference of 10 (units) in morphine consumption between the control group and the TAP group is considered clinically significant, at 2-sided type 1 error of 0.05, 90% power, and SD of 10 for both the groups, a sample size of 30 per group was required to detect a significant difference.

RESULTS

The demographic data show that the mean age of the patients was 54.87 ± 9.30 years in the control group and 51.60 ± 11.19 years in the TAP group ($p 0.224$). According to the Pearson Chi-square test, the sex ratio in both the groups was comparable statistically ($p > 0.05$). The control group patient’s weight was 58.80 ± 10.89 kg and the TAP group 58.60 ± 10.24 ($p 0.942$). In both groups, 73% of the patients were of ASA grade II and 27% of the patients were of ASA grade III (Table 1).

Heart rate, systolic BP, and diastolic BP were measured at the time interval of 0, 2, 4, 6, 12, 18, and 24 hours postoperatively which is represented as T1, T2, T3, T4, T5, T6, and T7, respectively, and were comparable; statistically significant differences were not found between two groups for hemodynamic monitoring.

Table 1: Demographic data

Group	Control $n = 30$	TAP block $n = 30$	<i>p</i> value
Age (year)	$54.87 + 9.30$	$51.60 + 11.19$	0.224
Male/female	3/27	4/26	1.000
Weight (kg)	$58.80 + 10.89$	$58.60 + 10.24$	0.942
ASA grade I/II/III	0/20/10	0/22/8	1.000

Average pain scores at different time intervals (T1, T2, T3, T4, T5, T6, and T7) at rest and on the knee flexion in two groups during the postoperative period are shown in Table 2 and the graph in Figure 3 shows a comparison of the VAS pain score at rest and on knee flexion between control and TAP group patients.

The VAS pain score at rest was ≥ 3 and found to be comparable at T1 and T2 hour in both groups. From T4 to T7 time points, the VAS pain score at rest was less than 3 in the TAP group compared with the control group and the difference is statistically significant at T5 a p value of 0.002. At T7 (24 hours), there is a significant decrease in pain in the TAP group at rest and the VAS pain score was < 2 ($p 0.006$).

The VAS pain score on knee flexion was found to be > 4 in both groups and patients were experiencing moderate pain at T1 and T2. At T4 (6 hours) and T5 (12 hours), the VAS pain score was < 4 in both groups, at T5 hours, the TAP group patients had better pain relief with a p value of < 0.001 . At T6 (18 hours), the p value was 0.022 and, at T7 (24 hours), the VAS pain score < 3 in both the groups, there is a significant decrease in pain in the TAP group ($p = 0.044$).

Figure 4 illustrates total and good PCA morphine demands in the control and the TAP group at the time points T2–T7 from 0 to 24 hours, the control group patients made more total demands of PCA morphine bolus compared to the TAP group from 6 to 24 hours. Up to 24 hours, total median demands for the control group were 113 and, for the TAP group, were 63, and the difference is highly significant ($p < 0.001$). The difference was significant postoperative from 6 to 24 hours.

It was observed that at T2 and T3 postoperatively, there was no statistically significant difference in median good demands. At T4 (6 hours postoperatively), median good demands in the control group and the TAP group were 15.5 and 10.5, respectively, after 6 hour, median good demands decreased in the TAP group as patients experienced lesser pain, and the difference was significant ($p < 0.05$) statistically. Up to T5 hours, good demands for the control group were 20.5 and, for the TAP group, 15.0. Up to T6 hours, good demands for the control group were 29.0 and, for the TAP group, 16.5. At T7 postoperative 24 hours, total median good demands in the TAP group were 19 as compared to 32 in the control group, and the difference is highly significant ($p < 0.001$).

The sedation score was between 0 and 2 in both groups. In the TAP group, only 6 patients were mildly sedated responding to verbal

Table 2: Table showing VAS pain score at rest and on knee flexion at different time intervals in two groups

VAS (rest and knee flexion)	Control group ($n = 30$)		TAP group ($n = 30$)		<i>p</i> value
	Mean \pm SD	Min–Max	Mean \pm SD	Min–Max	
T1 0 hours at rest	3.43 ± 0.50	3–4	3.43 ± 0.63	2–4	1.000
0 hours knee flex	4.37 ± 0.49	4–5	4.47 ± 0.86	3–5	0.582
T2 2 hours at rest	3.43 ± 0.57	2–4	3.27 ± 0.74	2–4	0.332
2 hours knee flex	4.30 ± 0.47	4–5	4.10 ± 1.09	2–6	0.361
T3 4 hours at rest	3.13 ± 0.51	2–4	2.77 ± 0.77	1–4	0.034
4 hours knee flex	3.77 ± 0.50	3–5	3.65 ± 0.90	2–5	0.220
T4 6 hours at rest	2.83 ± 0.59	2–4	2.43 ± 0.77	1–4	0.028
6 hours knee flex	3.47 ± 0.51	3–4	3.27 ± 0.83	2–5	0.028
T5 12 hours at rest	2.53 ± 0.63	2–4	2.03 ± 0.56	1–3	0.002
12 hours knee flex	3.37 ± 0.56	2–4	3.03 ± 0.70	1–4	< 0.001
T6 18 hours at rest	2.27 ± 0.45	2–3	2.00 ± 0.59	1–4	0.043
18 hours knee flex	2.93 ± 0.74	2–4	2.72 ± 0.68	1–4	0.022
T7 24 hours at rest	2.23 ± 0.43	2–3	1.90 ± 0.48	1–3	0.006
24 hours knee flex	2.73 ± 0.69	2–4	2.57 ± 0.62	1–4	0.044



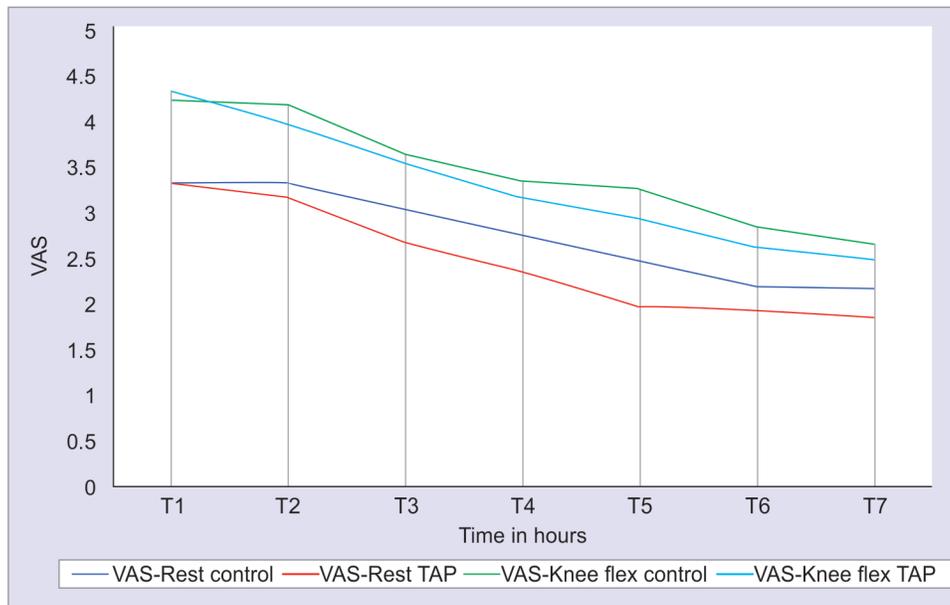


Fig. 3: Comparison of VAS pain score at (rest) and on knee flexion between control and TAP group

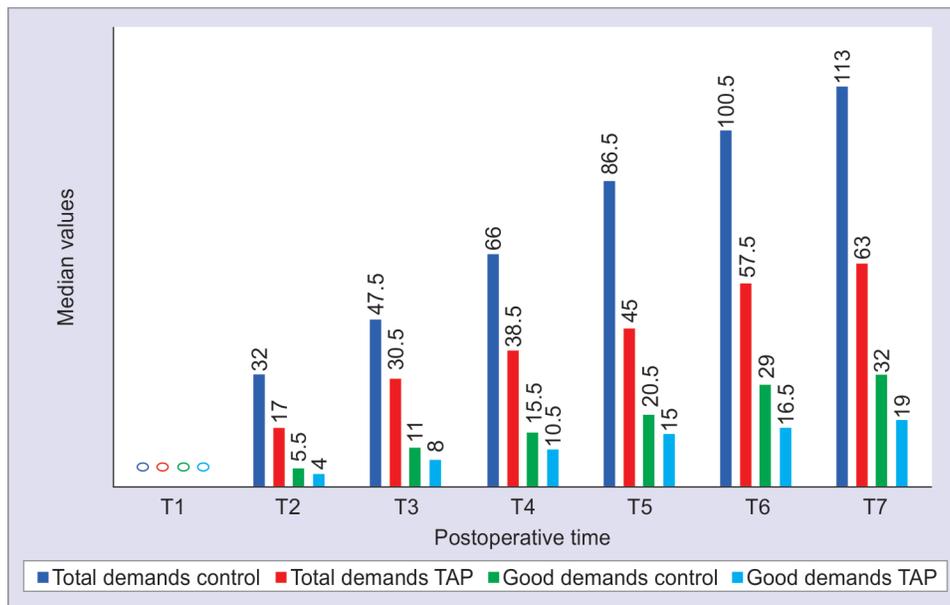


Fig. 4: PCA morphine total and good demands in the control and the TAP group

commands at 6 hours and 18 hours in PACU. In the control group, 7 patients were mildly sedated at 4 hours and 12 hours. However, the difference was not statistically significant.

Patients in both the groups did not experience nausea and vomiting up to 12 hours. At 18 hours, 7% of the patients in the control group and 3% in the TAP group ($p = 0.612$) and, at 24 hours, 3% of the patients in the control group and 0% in the TAP group ($p = 1.000$) experienced mild nausea. The difference is not statistically significant between the two groups. At 18 hours, 6.7% of the patients in the control group and 3.3% in the TAP group complained of itching but the difference is not statistically significant, $p > 0.05$.

DISCUSSION

The TAP block is one of the most novel methods for providing effective postoperative analgesia up to first 24 hours postoperatively in major

abdominal oncosurgeries. Adequate postoperative analgesia decreases postoperative cardiorespiratory and thromboembolic complications, hastens surgical recovery, ambulation, and patient satisfaction. TAP block reduces the requirement and side effects of opioids.³

The major cause of the pain experienced by patients after abdominal surgery is parietal in origin and derived from the abdominal wall incision conducted via thoracolumbar nerves T7–L1. The anterior primary rami of these nerves pierce the musculature of the lateral abdominal wall to course through a neurofascial plane between the internal oblique and transversus abdominis muscles. The TAP, thus, provides a space into which LA can be deposited, thus, blocking the afferents providing pain relief.⁴

After completion of the surgical procedure, we performed an ultrasound-guided bilateral posterior TAP block with a catheter

placement in the TAP, the patient received 20 mL of 0.25% bupivacaine (100 mg) bolus and every 8 hourly up to 24 hours to maintain the afferent blockade and avoid breakthrough pain. In our study, none of the patients had an injury to the intestines, liver, abdominal organs, and femoral nerve palsy. Petersen et al. suggested that the ultrasound-guided TAP block decreases the number of attempts, increases the accuracy, and reduces the time of onset of effect with negligible possibility of accidental puncture of gastrointestinal organs.⁵ Walker has cautioned as the femoral nerve lies in the same tissue plane; as the space deep to transversus abdominis, it is possible that the deep placement of even a portion of the injectate for a TAP block could cause femoral nerve palsy; hence, great accuracy should be maintained even with ultrasound guidance.⁶

The reported duration of action in the TAP block is 6–8 hours after a single-shot injection, while it may be prolonged in conjunction with PCA morphine. We repeated a dosage of 100 mg bupivacaine 8 hourly to maintain adequate analgesia; the intermittent bolus causes hydrodissection and excellent drug spread.^{7,9}

Ng et al. included 14 studies consisting of 770 women (389 TAP and 381 control) in the meta-analysis of randomized controlled trials of the analgesic efficacy of TAP blocks vs control after Caesarean delivery with different dosing classified as high-dose HD or low-dose LD (bupivacaine equivalents >50 or 50 mg per block side, respectively). Authors concluded that low-dose TAP blocks for cesarean delivery provide analgesia with reduced 24-hour opioid consumption and LA toxicity risk compared with the high-dose blocks. We administered low-dose 50 mg bupivacaine 8 hourly.⁸

We placed a bilateral TAP catheter via the posterior technique; Abdallah et al. analyzed 12 RCTs including 641 patients. Four trials examined the posterior technique and eight assessed the lateral technique. Compared with the lateral block, the posterior TAP block reduced rest and dynamic pain scores at 12, 24, 36, and 48 hours and reduced postoperative morphine consumption during the 12–24 hours and 24–48 hours intervals by 9.1 mg and 5 mg, respectively. It was concluded that the posterior TAP block appears to produce more prolonged analgesia than the lateral TAP block.¹⁰

With the tip of the needle placed between the internal oblique and the transversus abdominis muscles, studies in cadavers and healthy volunteers suggest that a 20 mL solution spreads from the iliac crest to the costal margin and ensures a complete sensory blockade of the abdominal wall.¹¹ Mc Donnell et al. demonstrated in volunteers and cadavers spread of methylene blue dye solution when placed in the lumbar triangle of petit by conducting computerized tomographic and magnetic resonance imaging studies, the deposition was observed throughout the TAP. The sensory block extended from T7 to L1 and receded over 4–6 hours.¹² Khatibidi et al. in the study involving healthy volunteers demonstrated that changing the LA administration technique (continuous basal vs hourly bolus) when using ropivacaine 0.2% and bilateral TAP catheters at 8 mL/hour and 24 mL bolus every 3 hours does not significantly influence the cutaneous effects after 6 hours of administration. In our study, we installed 50 mg bupivacaine as diluted 20 mL solution bilaterally every 8 hourly, VAS pain score in the TAP group patients was less than the control group patients both at rest and on movement T4 (6 hours) onwards and the difference is statistically significant.¹³

In our study, we compared the analgesic efficacy of the TAP block and requirement of opioids in the TAP and the control group.

PCA with IV morphine and paracetamol was provided to both the groups. TAP group patients had better pain relief and reduced morphine requirements.

The primary outcome measure was VAS pain score at different time intervals in both groups at rest and on knee flexion up to 24 hours. We observed that the VAS pain score at rest at 6, 12, and 18 hours was less for the TAP group ($p < 0.05$). At 24 hours (T7), the VAS pain score at rest was 1.90 ± 0.48 in the TAP group as compared to 2.23 ± 0.43 ($p = 0.006$) in the control group suggesting a statistically significant good pain relief in TAP group patients (Table 1).

The VAS pain score between the two groups on knee flexion at 0, 2, and 4 hours was not statistically significant; it was >4 but <5 in both groups. At 6 hours (T4), the p value was 0.028, at 12 hour time frame (T5), the VAS pain score was 3.37 ± 0.56 in the control group and 3.03 ± 0.70 in the TAP group ($p < 0.001$); at 18 hours, it was 2.93 ± 0.74 in the control group and 2.72 ± 0.68 in the TAP group ($p = 0.022$). At 24 hours, the mean VAS pain score at knee flexion was 2.57 ± 0.62 in the TAP group as compared to 2.73 ± 0.69 ($p = 0.044$) in the control group (Table 2). Patients with the TAP catheter had good pain control on movement 6 hours onwards till 24 hours which is statistically significant. The peak effect of bupivacaine is observed after 4 hours due to its slow absorption from TAP leading to effective analgesia after 4 hours.

McDonnell et al. studied analgesic efficacy of TAP block in 32 adults undergoing large bowel resection via a midline abdominal incision, patients were randomized to receive standard care (PCA morphine and nonsteroidal anti-inflammatory (NSAI) drugs, or TAP block with 20 mL of 0.375% levobupivacaine deposited into the TAP via the bilateral lumbar triangles of Petit and standard care). Each patient was assessed in the PACU at 2, 4, 6, and 24 hours postoperatively. The TAP block reduced VAS pain scores (TAP vs control, mean \pm SD) on emergence (1 ± 1.4 vs 6.6 ± 2.8 , $p \pm 0.05$), and at all postoperative time points, including at 24 h (1.7 ± 1.7 vs 3.1 ± 1.5 , $p \pm 0.05$). Authors concluded that the TAP block provided highly effective postoperative analgesia and patient's satisfaction in the first 24 postoperative hours after major abdominal surgery.⁴

Carney et al. studied 50 females undergoing an elective total abdominal hysterectomy. The TAP block group bilaterally received ropivacaine 1.5 mg/kg (to a maximal dose of 150 mg) vs the placebo received saline, both groups received PCA iv morphine analgesia and NSAIDs. In PACU, patients were assessed at time points from 2 to 48 hours. The TAP block with ropivacaine had reduced postoperative VAS pain scores compared to placebo block $p \leq 0.001$ at 4 hours and $p < 0.05$ at 24 hours.¹⁴

In the five trials with 312 patients included in the meta-analysis, Abdallah et al. concluded that the TAP block provides superior analgesia with reduced VAS pain scores by 0.8 cm (95% CI 21.53–20.05, $p \frac{1}{4} 0.01$) and reduced mean 24 hours i.v. morphine consumption by 24 mg [95% confidence interval (CI) 239.65–27.78] when spinal morphine was not used.¹⁵

The secondary outcome measure was to study total and good PCA iv morphine demands in milligrams in both groups with a 24-hour time frame. PCA provided additional analgesia on demand to both control and TAP group patients if VAS pain score ≥ 3 . PCA empowers patients to self-administer predefined boluses iv morphine 1 mg on demand with a lockout interval of 10 minutes, thus, optimizing pain control and amount of opioids thereby decreasing the side effects. In our study, the analgesic efficacy of the TAP block was superior with reduced PCA morphine demands compared to the control group. Up to 24 hours, total median

demands for the control group vs the TAP group were 113 vs 63, and the difference is highly significant ($p < 0.001$). Median good demands in the control vs the TAP group up to 24 hours in PACU were 32 vs 19, and the difference is highly significant ($p < 0.001$) indicating the efficacy of the TAP block in reducing the consumption of morphine after major lower abdominal oncosurgeries.¹¹

In the comparative study involving elective abdominal surgeries conducted by Rao Kadam et al., TAP group patients received a continuous infusion of 0.2% ropivacaine at a rate of 8–10 mL/hour for 72 hours and both the TAP and the control group received PCA fentanyl. The authors concluded that combining the TAP block with multimodal analgesia and fentanyl PCA for visceral pain gave satisfactory pain scores in major abdominal surgery.¹⁶

Nils Bjerregaard et al. studied 15 patients for lower abdominal surgery; a bilateral ultrasound-guided TAP catheter was placed first dose of 20 mL of bupivacaine 2.5 mg/mL with epinephrine 5 µg/mL given with direct real-time ultrasound visualization followed by three bolus doses of 20 mL bupivacaine 2.5 mg/mL bilaterally via the TAP catheters at 12, 24, and 36 hours. The authors observed that administration of repeated bolus doses of bupivacaine causes hydrodissection of TAP with a significant spread of LA and the TAP block as a part of a multimodal analgesic regimen resulted in acceptable pain scores and relatively low opioid requirements.⁷

Carney et al. in the study involving patients undergoing elective total abdominal hysterectomy observed that in the TAP group, mean (SD) total morphine requirements in the first 48 postoperative hours were reduced (55 ± 17 mg vs 27 ± 20 mg, $p < 0.001$). The TAP block, as a component of a multimodal analgesic regimen, provided superior analgesia when compared with the placebo block up to 48 hours postoperative.¹⁴

Griffith et al. performed a randomized placebo-controlled trial comparing bilateral ultrasound-guided TAP blocks (2×20 mL 0.5% ropivacaine or 0.9% saline) in 65 adult female patients undergoing midline laparotomy for gynecological malignancy. Both groups received multimodal IV analgesia. There were no significant differences between the control and treatment groups in the proportion of patients with inadequate analgesia VAS pain score >50 mm either at rest (39% vs 22%, $p = 0.13$) or with coughing (61% vs 53%, $p = 0.54$) at 2 hours. There was no significant difference in postoperative morphine consumption between the placebo and treatment groups at 2 hours (13.5 mg vs 11.87 mg, $p = 0.53$) or 24 hours (34.0 mg vs 36.1 mg, $p = 0.76$). Authors concluded that TAP blockade conferred no benefit in addition to multimodal analgesia in women undergoing major gynecological cancer.¹⁷

Rao Kadam et al. compared continuous TAP block with continuous epidural analgesia for major abdominal surgery. Patients in the epidural group received a bolus of 8–15 mL of ropivacaine 0.2% and an infusion of 5–15 mL/hour and, the TAP block group, a bolus dose of 20 mL of ropivacaine 0.375% bilaterally and an infusion of 0.2% ropivacaine 8 mL/hour bilaterally, for 3 days. Both groups received paracetamol and PCA with fentanyl for 3 days. In this underpowered study, authors found comparable results between the epidural and the TAP group with regard to pain scores, total fentanyl requirement, and satisfaction after abdominal surgery.¹⁸

The TAP block group had reduced the VAS pain score both at rest and on knee flexion and reduced PCA morphine demands as compared to the control group. Nausea/vomiting score and sedation score were found to be less in the TAP group but statistically insignificant.

Main advantages of TAP catheter are superior analgesia with improved patient comfort, decreased use of opioids and, hence, decreased nausea, vomiting, sedation, or respiratory depression. Compared to the epidural block, there is the absence of sympathetic or motor deficit and potential damage to the spinal cord. The ultrasound-guided TAP block with catheter placement is an alternative effective technique for postoperative analgesia in patients with contraindications for epidural analgesia.⁹ Disadvantage of the TAP block include possible sparing of dermatomes even with optimal drug dosage and catheter placement in the TAP. The bilateral block has to be performed and visceral pain is not relieved. Rarely, peritoneal, hollow viscous or organ perforation, and intravascular local anesthetic toxicity can occur.¹¹

Limitations of our study are that the level of dermatome block was not demonstrated and blood levels of bupivacaine were not measured though clinically none of the patients showed signs of bupivacaine toxicity.

CONCLUSION

Ultrasound-guided bilateral TAP block with intermittent boluses 0.25% bupivacaine 20 mL 8 hourly along with rescue PCA with IV morphine provides superior postoperative analgesia at rest and on movement in patients undergoing lower major abdominal oncosurgeries with reduced opioid-related side effects.¹⁴

CLINICAL SIGNIFICANCE

Ultrasound-guided TAP block catheterization increases the success rate and reduces neurovascular complications. Administration of 50 mg bupivacaine 8 hourly as the TAP block can be a major component of multimodal analgesia regimen for postoperative pain relief in abdominal oncosurgeries.

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