

ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK VERSUS STANDARD ANALGESIC CARE FOR POSTOPERATIVE PAIN RELIEF FOLLOWING TOTAL ABDOMINAL HYSTERECTOMY, AN OBSERVATIONAL STUDY

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ABSTRACT

BACKGROUND

The transversus abdominis plane (TAP) block is a technique which blocks the sensory nerves supplying the anterior abdominal wall. This prospective cohort study was done to evaluate the effectiveness of TAP block for postoperative pain in patients undergoing total abdominal hysterectomy.

MATERIALS AND METHODS

Sixty patients of ASA Grade 1 and 2 undergoing open abdominal hysterectomy were prospectively allocated into Group A and Group B. Group A patients (n = 30), received ultrasound guided TAP block along with 1 gm paracetamol 8th hourly and tramadol 1 mg/ kg as rescue analgesic. Group B patients (n = 30) received standard analgesic care with 1 gm paracetamol 8th hourly and tramadol 1 mg/ kg as rescue analgesic. TAP block was performed on completion of surgery in Group A patients by instilling 20 ml of 0.25% levobupivacaine into the transversus abdominis plane on each side under ultrasound guidance. Postoperatively Verbal Numerical Rating Scale, Sedation score, Nausea categorical scoring scale at 2, 4, 6, 12 and 24 hours and total tramadol requirement in first 24 hours were assessed in each group.

RESULTS

Verbal Numerical Rating Scale score was significantly reduced in Group A compared to Group B at 2, 4, 6 and 24 hours postoperatively and there was no difference in scores 12 hours postoperatively. Nausea was significantly lower in Group A patients at 2, 4 and 6 hours postoperatively with no difference at 12 and 24 hours postoperatively. There was significant difference in the sedation scale at 4, 6 and 24 hours postoperatively and no difference between both groups at 2 hours and 12 hours postoperatively. Total tramadol requirement in first 24 hours postoperatively was significantly lower in Group A compared to Group B (60.83 ± 14.208 mg Vs. 121.67 ± 19.402 mg, P value < 0.00).

CONCLUSION

Ultrasound guided TAP block along with standard analgesic care provided better analgesia as compared to standard analgesic care alone in the first 24 hours postoperatively after open abdominal hysterectomy. Postoperative nausea, vomiting and sedation were reduced in the ultrasound guided TAP block group.

KEYWORDS

Ultrasound Guided Transversus Abdominis Plane Block, Abdominal Hysterectomy, Verbal Numerical Rating Scale.

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BACKGROUND

A majority of patients scheduled for surgery are anxious about the postoperative pain.¹ Inadequately treated postoperative pain can affect the patient's ability to ambulate and can lead to adverse effects like

thromboembolism, myocardial ischemia, and arrhythmia.^{2,3} Pain after abdominal hysterectomy arises from several structures that are traumatized during surgery and it is moderate to severe in nature especially in the early postoperative period. A major part of pain experienced by the patient after an abdominal surgery is from abdominal wall incision.

Multimodal techniques consisting of a combination of opioids, nonsteroidal anti-inflammatory drugs and acetaminophen as well as patient-controlled analgesia are currently used for controlling pain after surgery. Intravenously administered opioids can cause nausea, vomiting, drowsiness and respiratory depression.⁴

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Epidural technique, which delivers the analgesic drugs through a catheter placed into the epidural space, can cause adverse effects such as hypotension, respiratory depression, pruritus and urinary retention. There has been a recent trend towards moving from central block to peripheral nerve blocks and other less invasive methods for pain relief. Transversus Abdominis Plane block is one such peripheral nerve block.

Ultrasound-guided nerve block offers an extra advantage of needle visualization, as well as visualization of the target tissue and surrounding structures. Real time images can be visualised, and drug can be instilled more precisely and rapidly into the target area. This enhances the safety and efficacy of the procedure and is therefore preferred over the block using a nerve stimulator or blocking the nerves blindly.

MATERIALS AND METHODS

The study was conducted as a prospective cohort study in the Department of Anaesthesiology, Government Medical College, and Trissur after obtaining approval from hospital ethics committee and written informed consent from 60 adult females who were posted for elective open abdominal hysterectomy.

Patients between 30-65 years weighing 45 to 65 kg with ASA physical status 1 & 2, were allocated prospectively into two groups A & B with 30 patients in each group.

The exclusion criteria were patient refusal for block or to participate in the study, patients with coagulopathy or local infection, seizure disorders, BMI>30 kg/ m², history of drug allergy or previous abdominal surgery.

Group A received TAP block in addition to the standard analgesia care of 1 gm paracetamol intravenously 8th hourly and Tramadol 1 mg/kg as rescue analgesic.

Group B received standard analgesia care of 1 gm paracetamol intravenous 8th hourly and Tramadol 1 mg/kg as rescue analgesic.

All patients underwent routine preanaesthetic check and during the preoperative visit, they were educated about Verbal Numerical Rating Scale (0 - 10),⁵ Sedation Score Scale (0 - 3), and Nausea categorical scoring scale (0 - 3).

Patients were kept NPO for 8 hours and T. Alprazolam 0.5 mg was given on the night prior to surgery. Intraoperative monitoring included Heart rate (HR), Electrocardiogram (ECG), Noninvasive Blood Pressure (NIBP) and pulse oximetry (SpO₂). Midazolam 1 mg was given intravenously. Spinal anaesthesia was administered with 3 ml of 0.5% Bupivacaine heavy (15 mg) intrathecally using 25G Quincke needle at L3-4 interspace. Only patients with successful spinal anaesthesia with sensory block at T6 level tested using a spirited cotton and motor blockade with a Bromage score of 0 were included in the study.

In Group A, after the completion of surgery, ultrasound guided TAP block with 0.25% levobupivacaine was given on either side. Sterile skin cleaning was performed with patients in the supine position, and the linear probe (5-10 MHz) of the USG device was prepared under sterile conditions. The TAP block was performed by an anaesthetist who had

undergone training in ultrasound guided regional anaesthesia and was experienced in giving USG guided TAP block. The probe was placed subcostally between the coastal margin and the iliac crest in the lateral abdominal wall. External oblique, internal oblique, and transverses abdominis muscles were identified. By the in-plane technique, a 10 cm 18-G Tuohy needle was advanced, and 20 ml of 0.25% levobupivacaine was injected from medial to lateral, into Transversus abdominis plane on each side.

In group B, the standard analgesic care with 1 gm paracetamol intravenous 8th hourly was given. Intravenous Tramadol (1 mg/kg) was given as rescue analgesic if VNRS score >3 for both groups.

Postoperative total Tramadol requirement in 24 hours and VNRS score, sedation score, Nausea categorical scoring scale at 2, 4, 6, 12 and 24 hours were assessed.

Data was entered into Microsoft excel and analysed using SPSS statistical software version 2.0. Sample size was calculated using formula⁶ $(z\alpha \pm z\beta)^2 \times S^2 / d^2$, Where Z α is 1.96 and Z β is 0.84, S (Standard deviation) = S1 \pm S2/2, and d=difference between means, based on the study by Priya Sharma et al⁷ with a power of 80% and significance level of 0.05. Quantitative data analysis was done using mean, standard deviation and independent t test.

RESULTS

Of the 60 patients, initially included in the study, all patients completed the study.

	Group A (N 30)	Group B (N 30)	P value
Age	46 \pm 7.697	49.27 \pm 7.395	0.09
Weight	55.10 \pm 4.730	57.63 \pm 5.068	0.05

Table 1 Patient characteristics

	Group A (N 30)	Group B (N 30)	P value
Total tramadol requirement (mg)	60.83 \pm 14.208	121.67 \pm 19.402	<0.00

Table 2. Total Tramadol Requirements

Time	VNRS Scale	GROUP A	GROUP B	P value
2 hours	0	30	0	<0.00
	2	0	30	
4 hours	0	29	0	<0.00
	1	1	13	
	2	0	17	
6 hours	0	25	2	<0.00
	1	5	22	
	2	0	6	
12 hours	0	15	6	0.19
	1	15	21	
	2	0	3	
24 hours	0	15	3	0.01
	1	15	27	

Table 3. Postoperative VNRS Scores

Time	Nausea Scale	Group A	Group B	P value
2 hours	0	18	0	<0.00
	1	12	21	
	2	0	9	
4 hours	0	27	6	<0.00
	1	3	22	
	2	0	2	
6 hours	0	30	25	0.05
	1	0	5	
12 hours	0	30	29	0.31
	1	0	1	
24 hours	0	30	30	

Table 4. Postoperative Nausea Categorical Scores

Time	Sedation Scale	Group A	Group B	P value
2 hours	0	30	28	0.492
	1	0	2	
4 hours	0	18	3	<0.00
	1	12	27	
6 hours	0	30	7	<0.00
	1	0	23	
12 hours	0	30	28	0.492
	1	0	2	
24 hours	0	30	30	

Table 5. Postoperative Sedation Scores

The two groups were comparable in terms of age and weight.

Total tramadol requirement in 24 hours (mean) for Group A was 60.83 ± 14.208 (mg) and for Group B was 121.67 ± 19.402 (mg). There was a significant difference in tramadol consumption between the two groups.

There was statistically significant difference in the VNRS scores for both groups at 2, 4, 6 and 24 hours postoperatively. However the difference in the VNRS score at 12 hours postoperatively was not significant.

There was a significant difference in nausea between the two groups at 2, 4 and 6 hours postoperatively whereas there was no difference between the groups at 12 and 24 hours postoperatively.

There was significant difference in the sedation scale at 4, 6 and 24 hours postoperatively whereas there was no difference between both groups at 2 hours and 12 hours postoperatively.

DISCUSSION

The transversus abdominis plane (TAP) block is a relatively new regional anaesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall. It was introduced in anaesthesia practice by Rafi in 2001.⁸ It has a high margin of safety and is technically simple to perform, especially under ultrasound guidance. It blocks the sensory nerves (T7-T12 and L1) supplying the anterior abdominal wall by introducing local anaesthetics into a neurovascular plane between the internal oblique and transversus abdominis muscle layers. TAP block is now being used as a component of multimodal analgesia for postoperative pain relief in wide variety of surgeries like hernia repair,⁹ open

appendectomy,¹⁰ large bowel resection,¹¹ retropubic prostatectomy,¹² nephrectomy,¹³ laparoscopic cholecystectomy,¹⁴ abdominal hysterectomy,¹⁵ and caesarean section.¹⁶

The ultrasound-guided approach was first described in 2007 by Hebbard et al.¹⁷ They applied ultrasound probe transversely to the anterolateral abdominal wall where all the three muscle layers are clearer. After identification of the TAP between the internal oblique and transversus abdominis muscles, the probe was moved posterolaterally across the mid axillary line just above the iliac crest (i.e., over the triangle of Petit). The block needle was then introduced anteriorly and further advanced in an in-plane approach. Real-time ultrasonography allows easy needle visualization as it approaches and enters the target fascial plane. A hypoechoic layer, created by injection of local anaesthetic, is also easily visualized. Hebbard et al. also noted that the “pop” sensations in the classic approach could be inaccurate due to anatomic variability. This ultrasound guided technique is commonly referred to as the Posterior approach.

In 2008, Hebbard introduced another ultrasound guided TAP block technique designed for upper abdominal surgery referred to as the oblique subcostal approach.¹⁸ In this variation, the needle entered the skin near the xiphoid and was advanced inferolaterally in a manner that local anaesthetics delivered to the TAP along the costal margin.

Borglum et al. recently described an ultrasound-guided, four-point, single-shot technique that combines the posterior and oblique subcostal techniques in an effort to provide a better bilateral analgesic coverage.¹⁹

Bhattacharjee et al²⁰ in 2014 conducted a study in total abdominal hysterectomy. They used 0.5 ml/kg/side of 0.25% bupivacaine to one group and normal saline 0.5 ml/kg/side to the second group and found out that TAP block provides better perioperative analgesia.

Sharma et al⁷ in 2011 conducted a study on sixty patients of either sex of ASA grade 1 and 2 who underwent major gynaecological or surgical operation. They were randomized either to receive standard care, including patient -controlled tramadol analgesia (n = 30), or to undergo TAP block (n= 30) in addition to standard care. After completion of surgery, 20 ml of 0.375% levobupivacaine was deposited into the transversus abdominis neurofascial plane via the bilateral lumbar triangles of Petit. They concluded that the TAP block provided highly effective postoperative analgesia in the first 24 postoperative hours after major abdominal surgery without any complications.

The TAP block is an effective and safe adjunct to multimodal postoperative analgesia for abdominal surgery. However, when comparing various studies, the results are conflicting. While most of the studies indicate that TAP block provides superior analgesia when compared to other intravenous and oral medications in decreasing postoperative pain and narcotic usage, there are some studies which showed that the benefits are not significant.

In our study we found that addition of ultrasound guided TAP block to the standard analgesia care provided

better postoperative analgesia as compared to standard analgesic care alone in the first 24 hours after open abdominal hysterectomy. The TAP block reduced postoperative pain as assessed by Verbal numerical rating scale scores, and reduced postoperative opioid requirements. During the first 24 hours, there was a reduction in the mean intravenous tramadol requirements. This reduction in opioid requirement resulted in fewer opioid mediated side effects. Postoperative nausea and vomiting as well as sedation were reduced in the ultrasound guided TAP block group and no complications due to the TAP block were detected.

The results of our study should be interpreted in the light of its limitations. It was not a randomized trial; the sample size was fairly small, and blinding was not possible as TAP block was given only to patients in one group.

CONCLUSION

This study was done to evaluate the effectiveness of TAP block in providing postoperative analgesia in patients undergoing total abdominal hysterectomy. We found that the TAP block provided effective and prolonged postoperative analgesia compared to standard analgesic care. TAP block was easy to perform, it provided effective analgesia and no complications occurred in our study.

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