

Evaluation of USG Guided Transversus Abdominis Plane Block for Post-Operative Analgesia in Total Abdominal Hysterectomy Surgeries

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Abstract

Introduction and aims: Transversus abdominis plane (TAP) block is a fascial plane block providing postoperative analgesia in patients undergoing surgery with infraumbilical incision. This single blind prospective randomized control study aimed to evaluate the effectiveness of the TAP block for postoperative pain, as part of a multimodal analgesic regimen in patients undergoing TAH.

Material and methods: Sixty adult female patients undergoing Total Abdominal Hysterectomy (TAH) under general anaesthesia were randomized to undergo TAP block with Ropivacaine along with intravenous paracetamol and diclofenac in group I (n=30) versus group II (n=30) with intravenous paracetamol and diclofenac alone. All patients were given inj.paracetamol 1gm infusion and inj.diclofenac 75 mg intravenously along with induction of anaesthesia. Group I patients additionally received ultrasound guided TAP Block bilaterally with Ropivacaine (0.25%) (25 ml on either side). Each patient was accessed separately by blinded observer at regular intervals upto 24 h for visual analogue scale (VAS), analgesic requirement, PONV and level of sedation using Ramsay sedation scale. If patients complained of pain or VAS>3, inj.Morphine 0.1 mg/kg was given. The observation in two groups was compared statistically using chi-square test and Paired t-test and analysed by SPSS version 18 software.

Result: Result showed that the mean visual analogue score (VAS) of group1 was statistically less than group 2 (P<0.001). Mean analgesic requirement in mg for first 24 h postoperatively was significantly less in group 1 (5.40 ± 3.701) than group 2 (9.40 ± 3.856).

Conclusion: TAP Block is easy to perform under ultrasound guidance without complication and it provides effective analgesia. TAP Block is effective holds good as a part of multimodal analgesia regimen for patients undergoing Total Abdominal Hysterectomy.

Keyword:

Total abdominal hysterectomy; Transversus abdominis plain block; Ropivacaine; Multimodal analgesia

Introduction

Total abdominal hysterectomy (TAH) is a commonly performed major surgical procedure that results in substantial postoperative pain and discomfort [1]. These patients require a multimodal postoperative pain treatment regimen that provides high quality analgesia with minimal side effects. A substantial component of the pain experienced by patients after abdominal surgery is derived from the abdominal wall incision [2]. A promising approach to the provision of postoperative analgesia after abdominal incision is to block the sensory nerve supply to the anterior abdominal wall [3]. However, the clinical utility of current approaches to the blockade of these nerve afferents, such as abdominal field blocks is limited, and the degree of block achieved can be unpredictable. So Rafi in 2001 first introduced the TAP block [4] and described it as block delivering local anaesthetics in the TAP using the iliac crest as anatomical landmarks by identifying the lumbar triangle of Petit. Hebbard et al. introduced the First USG guided approach for TAP block in 2007 [5].

Recent published clinical trials involving patients undergoing both major abdominal [6] as well as gynecological surgery have demonstrated promising results with this technique as part of a multimodal post-operative pain treatment. TAP block has been used for various abdominal procedures other than total abdominal hysterectomy such as large bowel resection, open/laparoscopic appendectomy, laparoscopic cholecystectomy, and open prostatectomy, abdominoplasty with or without flank liposuction, inguinal hernia and iliac crest bone graft [7-13].

This study was designed to evaluate the effectiveness of the TAP block for postoperative pain, as part of a multimodal analgesic regimen in patients undergoing TAH.

Material and Method

After obtaining approval from Institutional ethics committee and written informed consent, sixty ASA I and II adult patients undergoing elective total abdominal hysterectomy were included in prospective randomized single blinded control study which was completed over a period of 12 month.

Patients who had H/O allergy to Ropivacaine, diclofenac, pregnancy, BMI>35 chronic opioid use and who refused after inclusion were excluded.

Patients between age group between 30-65 years were randomly allocated into two group having 30 patients in each group. Patients were randomized by sealed envelopes, to undergo TAP block or to receive standard care. Group I (n=30) received intravenous paracetamol 1 gm 6th hourly and intravenous diclofenac 75 mg 12th hourly and Transversus Abdominis Plane block.

Group II (n=30) received paracetamol 1 gm 6th hourly and diclofenac 12th hourly only. After routine preoperative evaluation and machine check, surgery was performed under general anaesthesia with controlled ventilation. All Patients were premedicated with ondansetron 0.1 mg/kg. Anaesthesia was induced with Fentanyl 2 µg/kg, propofol 1-2.5 mg/kg and Endotracheal tube placement was facilitated with vecuronium 0.1 mg/kg. The Anaesthesia was maintained using Oxygen, Nitrous Oxide (30%:70%), Isoflurane 1%, and intermittent Fentanyl 1 µg/kg, Vecuronium 0.01 mg/kg as and when required.

Standard ASA monitors were used. All patients were given inj.paracetamol 1 gm infusion and inj.diclofenac 75 mg intravenously along with induction of anaesthesia. Group I patients additionally received Transversus Abdominis Plane Block with Ropivacaine 0.25%, 25 ml on both sides under USG guidance.

The patients randomized to undergo the TAP block underwent USG guided TAP block after induction of anaesthesia using linear array Transducer probe (Sono Site M-Torbo, SonoSite, Inc., Bothwell, MO, USA) of frequency 10-15 MHz by posterior approach on both side of Transversus Abdominis Plane.

Patient's vital parameters like Heart Rate, Blood pressure, oxygen saturation were noted on induction of anaesthesia and during surgery. Recordings were made by a blinded observer. After completion of the surgical procedure and emergence from anaesthesia, patients were transferred to the postoperative recovery room.

In postoperative recovery room all patients were monitored for Heart Rate, Blood Pressure, Saturation, Pain (VAS) PONV, Sedation and other complaints on immediate post-operative, 1, 2, 4, 6, 12, 24 h. If patients complained of pain or VAS>3 inj.Morphine 0.1 mg/kg was given. All recordings were done by a blinded observer. Pain and sedation were assessed by Visual analogue scale and Ramsay sedation scale respectively.

The statistical analysis was done using SPSS for Windows version 18.0 software. For non-continuous data Chi-square test was used. The mean and standard deviation of the parameters studied during observation period were calculated for two treatment groups and compared using Paired 't' test. The critical value of 'p' indicating the probability of significant difference was taken as<0.05 for comparisons.

Results

Sixty patients were registered in the study. Thirty Patients were randomized to undergo TAP blockade with 0.25% ropivacaine along with parenteral diclofenac 75 mg and paracetamol 1 gm, and remaining 30 were randomized as a control group receiving parenteral diclofenac 75 mg and paracetamol 1 gm only.

Groups were comparable in terms of age, weight, height, and BMI, surgery and anaesthesia time [Table 1]. In all patients randomized to

undergo TAP block, transversus abdominis Plane was located under the guidance of ultrasound and 0.25% ropivacaine was deposited on both sides without any complication.

Patients in TAP group had less heart rate and mean arterial pressure throughout 24 h. The Patients in TAP group had reduced VAS Score than control group all the time [Table 2]. The mean VAS Score was 2. Patients in TAP group had reduced mean morphine requirement (5.40 mg vs. 9.40 mg) in 24 h period [Table 3] and found to be statistically significant (P<0.001) consumption of morphine was significantly lower during immediate postoperative period (0-6 h).

There was no significant difference in sedation scores between both groups at any point of time except at 6hrs, where control group had more sedation score [Table 4]. The patients in TAP group had reduced incidence of postoperative nausea and vomiting at 2, 4, and 12 h and at rest of time there was no significant difference in the incidence [Table 5]. The patients in control group had high PONV scores (1 or more).

Parameters	Tap group (N=30)	Control group (N=30)	P-value
Age (yrs)	41.47 ± 5.501	43.20 ± 2.124	0.113
Weight (kg)	53.87 ± 7.829	55.10 ± 5.081	0.472
Height (cms)	153.30 ± 3.583	153.90 ± 2.881	0.478
BMI (kg/m ²)	23.80 ± 4.55	22.86 ± 1.70	0.29
Surgery time (min)	45.17 ± 9.436	45.47 ± 8.713	0.899
Anaesthesia time (min)	63.13 ± 10.504	62.13 ± 7.583	0.674

Tables 1: Demography and patients characteristic were comparable.

Vas Score	Group 1 (TAP)	Group 2 (Control)	P value
Immed Postop	2.53 ± 3.082	3.10 ± 1.768	0.386
1 h	2.80 ± 2.511	3.60 ± 1.773	0.159
2 h	1.93 ± 0.980	3.13 ± 1.279	<0.001
4 h	2.23 ± 0.679	3.40 ± 1.610	0.001
6 h	2.53 ± 1.408	3.67 ± 1.647	0.006
12 h	2.90 ± 1.729	3.97 ± 1.771	0.022
24 h	2.27 ± 0.640	3.17 ± 1.440	0.003

Tables 2: Comparison of Vas score between Group 1 and Group 2.

	Total analgesic req	P value
Group 1	5.40 ± 3.701	<0.001
Group 2	9.40 ± 3.856	
The cumulative morphine requirement is significantly lower in TAP Group. There is 57% reduction in mean morphine requirement in TAP group.		

Table 3: Mean morphine requirement in milligram in first 24 h after TAH.

Sedation scores (>3)	Tap group		p-value
	(no of patients)		
Immed Postop	4	2	0.389
1 h	0	1	0.315
2 h	3	3	1.000
4 h	0	0	-
6 h	0	0	-
12 h	0	0	-
24 h	0	0	-

Ramsay sedation scale was used. Only few patients were found to have Scores>3. There was no significant difference in sedation scores between two groups.

Tables 4: Ramsay sedation scale.

PONV (>1)	Tap group		Control group		P-value
	No.	%	No.	%	
Immed postop	0	0	0	0	---
1 h	3	10	1	3.3	0.302
2 h	0	0	5	16.7	0.019
4 h	1	3.3	9	30	0.005
6 h	0	0	1	3.3	0.315
12 h	0	0	6	20	0.009
24 h	0	0	3	10	0.075

The incidence of PONV was found to be more in control Group (p < 0.05) particularly during 2, 4 and 12th h.

Table 5: PONV score.

Discussion

This Randomised single blinded controlled clinical trial demonstrates that the TAP BLOCK when used as a part of multimodal analgesia provides effective analgesia for patients undergoing Total Abdominal Hysterectomy. It reduced the intensity of breakthrough pain and requirement of morphine. All blocks were done under ultrasound guidance which ensured the exact location. There was no block related complication. The standard regimen of injection paracetamol and diclofenac intravenously at our institution didn't provide good postoperative pain relief in all patients following TAH.

So a multimodal analgesia regimen is needed for providing effective postoperative pain relief. Substantial component of pain experienced by the patient is from abdominal wall incision in abdominal surgeries. So, any interventions that block pain from abdominal wall will provide good post-operative pain relief. TAP Block is a type of abdominal field block that anaesthetizes the nerve supplying the abdominal wall and being used for providing post-operative pain relief after abdominal surgeries both in adults and children.

In a systematic review, Moiniche et al. [14] found little evidence to support the use of instillation of local anesthetics into the wound incision. In contrast, the combination of intraperitoneal and incisional bupivacaine did provide some analgesia in this patient. However, more effective strategies are required for patients undergoing TAH.

TAP Block group had reduced VAS Scores throughout the 24 h postoperative period. The patients in TAP Group had significantly decreased VAS scores (p<0.05) for 24 h period except at 0, 1 h postoperative period with a mean VAS Score of 2. Similar decreased VAS Scores were also observed by John carney [15], Mc Donnell et al. [16], G. Niraj et al. [17]. In our study, the patients who received the TAP block had significantly reduced post-operative morphine consumption (p<0.03) at 2,4 and 6 h. TAP Block reduced the mean morphine consumption (mg) 5.40 mg vs. 9.40 mg in control group (p<0.001). TAP block had reduced the morphine requirement by 57% in our study and it is par with many clinical studies in patients who underwent laparotomy, caesarean surgeries. This shows the effectiveness of TAP block as a part of multimodal analgesia regimen and its ability of reducing opioid requirement and opioid related adverse effects.

In our study we found that addition of TAP Block to paracetamol and diclofenac showed reduced VAS Scores and morphine requirement for 24 h period. The addition of TAP block reduced the pain scores due to its ability to block transmission of nociceptive impulse from abdominal wall. This shows that single shot application of TAP Block can provide good pain relief for a period of 24 h. Many studies had showed beneficial effect of TAP Block in providing postoperative pain relief.

The TAP block has been demonstrated to provide excellent analgesia to the skin and musculature of the anterior abdominal wall in patients undergoing colonic resection surgery involving a midline abdominal wall incision, patients undergoing cesarean delivery (McDonnell JG et al.) [18] and patients undergoing radical prostatectomy (O'Donnell BD et al.) [19].

TAP Block also reduced the incidence of PONV. This may be due to the amount of morphine consumed in the TAP block group was sufficiently less compared to control group. In calculating the incidence of PONV, any score of above zero at any time point was taken as indicating that the patient had PONV. The control group had higher PONV scores (>1) particularly in early postoperative period (1-6 hrs) reflecting the use of morphine at similar period. Many clinical studies also observed similar reduced PONV incidence (McDonnell JG, Curley GCJ et al.) [19].

TAP block didn't made impact on sedation score. Both groups had accepted sedation scores (3 or less) and there was no significant difference in sedation scores between two groups. Even though control group patients had higher morphine consumption; there was no increase in sedation scores. This may be due to higher pain scores and PONV scores in these patients.

Limitations of Our Study

First we restricted our study period up to 24 h postoperative analgesia, however many studies have shown that TAP Block provides analgesia for around 48 h. Second, blinding was not perfect as sensations were lost over the abdomen and is a single blinded.

Future Recommendations

Further studies should be undertaken to evaluate the effectiveness of adding various drugs (opioid, dexmedetomidine) with local anaesthetics in Transversus Abdominis Plane block.

Conclusion

TAP Block is easy to perform under ultrasound guidance and it provides effective analgesia. TAP Block is effective holds good as a part of multimodal analgesia regimen for patients undergoing Total Abdominal Hysterectomy.

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