

Effectiveness of Transversus Abdominis Plane Block using Ropivacaine for Postoperative Analgesia in Total Abdominal Hysterectomy Patients.

Nitha C S¹, Kalyanibala Nayak²

¹Postgraduate, Department of Anaesthesiology, SCB Medical College, Cuttack

²Associate Professor, Department of Anaesthesiology, SCB Medical College, Cuttack

ABSTRACT

Background: Transversus abdominis plane (TAP) block is a safe, simple and effective technique of providing analgesia for below umbilical surgeries with easily identifiable landmarks. The study is done to study the analgesic efficacy and side effects of TAP block in total abdominal hysterectomy (TAH) patients using below umbilical incision. **Methods:** a prospective randomized control trial was performed. A bilateral TAP block was performed using 0.25% ropivacaine 1mg/kg in study group (T) using 22G needle, while in control TAP block was not given. The time taken to request for the first rescue analgesic, total consumption of tramadol and antiemetic in 48hrs, visual analog score (VAS) for 6, 12, 24, 48 hr postoperatively. The results were analyzed with SPSS 21 software. A P value <0.05 was considered significant. Student t test/Mann Whitney U test were used to find the significance. **Results:** In Group T, the time to the first dose of rescue analgesic (20.9 ± 4.12) was significantly more ($p = 0.001$) compared to group C (3.55 ± 0.44). The total amount of tramadol consumption in 48 hrs in group T (175 ± 25.2) was statistically significant ($P=0.001$) compared to group C (291 ± 24.1). The 48 HR analgesic requirement (11.52 ± 2.8) ($P=0.001$) and VAS at 6, 12, 24 and 48 h 0.00 (0-1), (2.4 ± 0.8), (2.6 ± 1.4), (1.8 ± 0.75) respectively were less in the Group T compared to group C. **Conclusion:** Transversus abdominis plane block proved to be an effective means of postoperative analgesia for TAH patients with minimal side effects.

Keywords: Hysterectomy, postoperative analgesia, triangle of petit.

INTRODUCTION

Transversus abdominis plane (TAP) block is a widely practiced peripheral nerve block utilized to anaesthetize the somatic nerves supplying the anterior abdominal wall by depositing local anaesthetic in the neurovascular plane between internal oblique and transversus abdominis muscle layer. It was introduced in anaesthetic practice in 2001 by Rafi utilizing the traditional anatomical landmark.^[1] TAP block has subsequently been used as a component of multimodal analgesia for postoperative pain relief following various surgical procedures such as large bowel resection, open appendectomy, retropublic prostatectomy, nephrectomy, hernia repair, laparoscopic cholecystectomy and caesarean section.^[2-9] Although Carney et al^[10] and Atim et al^[11] have observed analgesic benefit of TAP block in total abdominal hysterectomy by landmark based approach respectively, Griffith et al found that TAP block does not confer any definite analgesic benefit in major gynaecological procedures^[12] over multimodal analgesic regimen.

providing postoperative pain relief in patient undergoing total abdominal hysterectomy.

MATERIALS AND METHODS

After getting approval from the institutional research and ethics committees, a total of 100 patients ASA I and II posted for TAH via pfannenstiel incision in the age between 30-55 years in the obstetrics and gynaecology department, were selected and allocated randomly for conducting the study into study group (T) and control group (C) during 2015. Written informed consent was obtained from all subjects. The study design was that of a prospective randomized, controlled study. Assuming a power of 90%, a level of significance of 5%, a difference of means = 16mg of tramadol, and a common standard deviation=24.2, it was estimated that 50 patients would be required in each group. Unwilling patients, patients with comorbid illnesses like severe hypertension, diabetes, any history of local anaesthetic drug allergy, body mass index more than 30, history of opioid tolerance and local or systemic infections were excluded from the study. After obtaining written informed consent, the patients were allocated into study group (n=50) or control group (n=50) using a random number table. Name, age and In Patient (IP) number of each patient were recorded in the corresponding performa. Height and weight were measured and body mass index (BMI) calculated and recorded.

Name & Address of Corresponding Author

Dr. Nitha C S,
Postgraduate, Department of Anaesthesiology,
SCB Medical College, Cuttack
E-mail: nits0911@gmail.com

Based on these observations, the aim of present study was to elucidate the efficacy of bilateral TAP block as a component of multimodal analgesia for

All patients received standard aspiration prophylaxis preoperatively with ranitidine 50 mg IV and metoclopramide 0.15mg/kg up to a maximum of 10 mg IV half an hour before surgery. Electrocardiography (ECG), pulse oximetry, noninvasive blood pressure and heart rate were monitored in each patient. Supplemental oxygen was given to all patients.

Each patient received subarachnoid block using a 25G Quincke type spinal needle (BD medical) in the L3-L4 intervertebral space with 3.5mL of 0.5% bupivacaine heavy under all available aseptic measures. A sensory level of T4 was confirmed and TAH was done via a pfannenstiel incision.

After the procedure was over and dressing kept, all patients in the study group received bilateral TAP blocks with 1mg/kg of 0.25% ropivacaine upto a maximum of 20ml on each side. The control group did not receive this.

The commercial preparation of ropivacaine available in our centre is 0.75% ropivacaine 10/20 ml vial. It will be diluted three times using distilled water so as to prepare our study concentration 0.25%.

A loss of resistance technique was used to identify the transversus abdominis plane, as described by McDonnell JG^[9], O'Donnell BD, Curley J, et al. The iliac crest is palpated from anterior to posterior, locating the border of the latissimus dorsi muscle. The triangle of Petit is located just anterior to the latissimus dorsi muscle and posterior to the mid - axillary line. The 1.5-inch, 22-gauge needle was used to pierce the skin over the triangle of Petit just cephalad to the iliac crest holding it at right angles to the coronal plane. The needle was then stabilized and advanced at right angles to the skin in a coronal plane to a point where resistance was encountered—this resistance indicated that the tip of the needle is in the external oblique muscle. The needle was advanced further gently until a pop was felt as the needle entered the plane between the external oblique fascia and internal oblique fascia. Further gentle advancement to obtain a second pop indicated that the tip of the needle is in the plane between the internal oblique fascia and transversus abdominis fascia—the neurofascial plane. After careful aspiration to rule out intravascular placement, 1 mL local anaesthetic was injected to confirm needle placement in the correct plane. Presence of substantial resistance indicated that the needle was not positioned between the fascial planes, and was repositioned. Ropivacaine 0.25% was administered in a dose of 1mg/kg up to a maximum of 20ml on each side, observing closely for any signs of toxicity and aspirating at intervals to rule out intravascular placement. The procedure was repeated in the contra lateral side also. After the block, heart rate and blood pressure of the patients were well monitored. All patients received rectal diclofenac at a dose of 1 mg/kg up to a

maximum 100 mg after surgery. A postoperative analgesic regimen was started with oral paracetamol 1 gram every 6 hours.

Rescue analgesic was being given as tramadol 50mg intravenously when the patient complained of pain in between when the vas score is more than 4.

Rescue anti emetic was administered as ondansetron 4mg intravenously if the patient complained of nausea or vomiting. Requirement of rescue analgesics, nausea and vomiting and sedation were assessed. Each patient was asked to assess pain at rest at each time point, using visual analog scale [(VAS), an unmarked 10 mm line in which 0=no pain and 10=worst pain imaginable] and a verbal rating score.

The nausea was assessed using a categorical scoring system (0=none; 1=mild; 2=moderate; 3=severe). The nausea was defined as a nausea score >0 at any time point.

Sedation was assessed using a scoring system as follows: 0=awake and alert; 1=quietly awake; 3=asleep but easily arousable; 4=deep sleep. Presence of sedation is defined as sedation score >0 at any post-operative time period.

The assessment ended 48 hours after surgery. The observations were recorded in Microsoft excel spreadsheet and analysis was done using the SPSS 21 software. A P value <0.05 was considered significant. Student t test/Mann Whitney U test were used to find the significance. Duration of analgesia, 48 hr tramadol requirement, sedation score and 48 hr antiemetic requirement were analyzed by student 't' test. VAS Score, with paired comparison at each time interval, were performed using 't' test and Mann whitney U test.

RESULTS

100 patients were selected for the trial and the results from them were analysed. The two groups were comparable in terms of baseline demographic parameters like age, body weight (table 1), preoperative hemodynamic parameters (pulse rate, preoperative systolic and diastolic blood pressure, respiratory rate) and volume of study drug required in tap block.

Table 1: Comparison of patient characteristics between group T and group C

GROU P	TAP BLOCK(GROUP T) N=50	CONTROL GROUP(GROUP C) N=50	P value
AGE	46.80±4.6070	47.20±4.4124	0.950 *
WEIGHT	51.360±3.5557	53.280±3.7200	0.289 *

Values expressed in mean (SD) and proportions applicable.*independent sample t test

The mean duration of analgesia was 20.9 (± 4.12) hours in the study group and 3.55 (± 0.44) hours in the control group [Table 2]. This difference was also found to be significant ($P=0.001$). The total amount of postoperative rescue analgesic requirement was measured in terms of total milligrams of tramadol received. Mean values of total tramadol required were 175 (± 25.2) mg in group T and 291 (± 24.1) mg in group C [Table 2]. The difference was found to be statistically significant (p value 0.001) when analyzed using independent samples t test [Table 2].

Table 2: Comparison of time to first rescue analgesics and 48hr tramadol requirement between group T and group C

Parameters	With TAP BLOCK	In control	Significance
Time To The First Dose Of Tramadol In Hours	20.9(± 4.12)	3.55(± 0.44)	0.001*
Total Amount Of Tramadol In Mg Over 48 Hour	175(± 25.2)	291(± 24.1)	0.001*

Values expressed in mean (SD) and proportions applicable.*independent sample t test

Median VAS score at 6hr was found to be 0.00 mm and 5.5mm in the study and control group respectively which is statistically significant ($p=0.001$) [Table 3]. Mean values of vas score at 12, 24, 48 hr were (2.4 ± 0.8), (2.6 ± 1.4), (1.8 ± 0.75) respectively and were statistically significant [Table 3][Figure 1]. Sedation scores at the predefined time points were also compared. Significant difference was observed between the groups after 6hr [Table 3]. Antiemetic consumption over 48hrs in group T were a significantly reduced compared to group C ($P=0.001$)[Table 3].

DISCUSSION

The aim of the study was to determine the duration of analgesia of TAP block, quality of analgesia as assessed by VAS score and 48hr tramadol requirement and to note the incidence of side effects-sedation score and PONV, which follow opioid usage. The principal finding of our study was that TAP block using ropivacaine provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy.

Table 3: Comparison of Vas Score, Sedation Score And Amount of Antiemetic over 48hours

Parameters	Tap block(t)	Control(c)	Significance
Vas Score At 6 hour	0.00(0-1)	5.5(5-6)	0.001#

(in mm)			
Vas Score At 12 Hour(in mm)	2.4(± 0.8)	4.8(± 0.756)	0.001*
Vas Score At 24 Hour (in mm)	2.6(± 1.4)	4.7(± 0.79)	0.001*
Vas Score At 48 Hour (in mm)	1.8(± 0.75)	2.2(± 0.75)	0.009*
Sedation Score At 6 hr	1.1(± 0.7)	2.4(± 0.67)	0.001*
Total amount of antiemetic in mg over 48 hour	11.52(± 2.8)	21.2(± 2.8)	0.001*

Values expressed in mean (SD) or median (range) and proportions applicable.

*independent sample t test,# Mann whitney U TEST

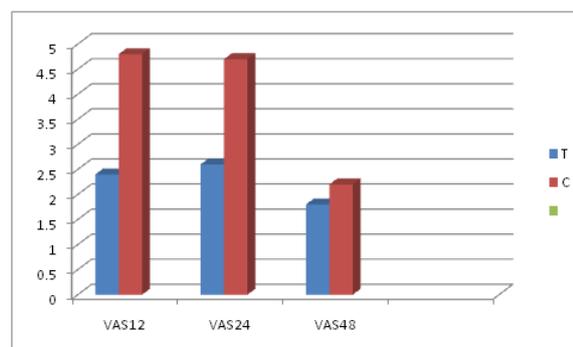


Figure 1: Postoperative VAS score comparison between group T and group C

TAP block has subsequently been used as a component of multimodal analgesia for postoperative pain relief following various surgical. Case reports have been published showing the successful use of TAP block using Petit triangle and subcostal combined technique for bowel surgery in high-risk elderly patients.^[19,20]

McMorrow et al^[13] demonstrated no analgesic effect with TAP block (using 0.375% bupivacaine) as compared to spinal morphine(100mcg) in patients undergoing caesarian section probably because of the effect of intrathecal morphine on both parietal and visceral components of pain while TAP block acts on only parietal components of pain. Another study shows no benefit from ultrasound guided TAP block(0.375% ropivacaine 20ml on each side) in patients undergoing caesarean section under spinal anaesthesia using intrathecal morphine^[14]. Opioid sparing effect of TAP block(0.375% ropivacaine 20 ml on each side) was investigated in another study and was found to have significantly reduced opioid consumption in first 6hr^[15].

The superiority of TAP block in providing postoperative analgesia is evident in our study by

lower VAS score in 6,12,24 hour. This finding is consistent with McDonnell et al^[2] in abdominal surgery and Carney et al in open appendectomy^[3]. Our study is consistent with yet another study conducted by Carney et al^[10] showing significant reduction in postoperative pain scores and postoperative morphine consumption for 48hr by using TAP block in TAH patients. Sharma et al^[16] also showed significant reduction in VAS scores after using TAP block in major abdominal surgeries. Bhattacharjee et al^[17] demonstrated the preoperative as well as the postoperative analgesic efficacy of TAP block in TAH patients using 0.25% bupivacaine (0.5ml/kg on each side).

The mean duration of postoperative analgesia in TAP block from our study was 20.9hr and we did not use any adjunct in our study. Clonidine in peripheral nerve block has been shown to significantly increase the duration^[18] and can be used here also. Seven of our patients did not receive any rescue analgesic for first 24hour. The cause of the prolonged analgesia following single shot TAP block is not clear. The transversus abdominis neurofascial plane with less vascularity may cause longer duration of action of local anaesthetics probably due to its slow clearance.

The most important clinical implication of our finding is the opioid sparing effect of TAP block in the postoperative period. Opioids, though effective in the management of postoperative pain, is associated with nausea vomiting pruritus and respiratory depression. Patients who are morbidly obese, having sleep apnea syndrome and elderly patients are maximally benefitted by this opioid sparing effect. It may be a safer alternative to neuraxial block in patients with coagulopathy for postoperative analgesia.

CONCLUSION

This study has tried to find out whether Transversus Abdominis Plane block is effective as an adjuvant in providing multimodal analgesia for post-operative analgesia after total abdominal hysterectomy under subarachnoid block. After conducting a randomized, controlled trial, the following conclusions have been reached: (after TAH under subarachnoid block)

1. TAP block reduces total rescue analgesic requirement in the first 48 hours
2. TAP block delays the time to request the first dose of rescue analgesic
3. TAP block reduces the incidence of postoperative nausea and vomiting
4. TAP block reduces the requirement of rescue antiemetic
5. TAP block reduces the incidence of sedation at 6hours postoperatively.

Thus, TAP block can be reliably used as a part of multimodal analgesic regimen for postoperative pain relief after TAH under subarachnoid block. It was easy to perform and provided effective analgesia, as found out by the study.

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How to cite this article: Nitha CS, Nayak K. Effectiveness of Transversus Abdominis Plane Block using Ropivacaine for Postoperative Analgesia in Total Abdominal Hysterectomy Patients. *Ann. Int. Med. Den. Res.* 2016;2(2):94-8.

Source of Support: Nil, **Conflict of Interest:** None declared