

# Effectiveness of Transversus Abdominis Plane Block as part of a Multimodal Analgesia to Reduce Opioid Consumption among Total Abdominal Hysterectomy Patients: A Randomized Control Trial

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## Abstract

**Background:** Generally patients after total abdominal hysterectomy have suffered from moderate to severe postoperative pain. Multimodal approach are using to reduce this pain.

**Objective:** The purpose of the present study was to observe the effectiveness of transversus abdominis plane block as part of a multimodal analgesia to reduce opioid consumption among total hysterectomy patients.

**Methodology:** This randomized control trial was conducted in Department of Anaesthesia, Analgesia, Palliative and Intensive Care Medicine of Dhaka Medical College and Hospital, Dhaka, Bangladesh from March 2016 to September 2018 for a period two years and six months. Women planned for an elective total abdominal hysterectomy under general anesthesia were selected as study population. Participants were selected and randomly divided into two groups designed as group I and group II. Patient of both group were given general anesthesia. Group I patient received 20 ml 0.25% bupivacaine and group II patient received 20 ml normal saline as placebo. Then dressing was done. The TAP block was performed after taking all aseptic precaution in the flank palpated between the 12<sup>th</sup> rib (Costal margin) and the iliac crest. After confirmation of correct position, 20 ml 0.25% bupivacaine was given to group I patient and 20 ml normal saline was given to group II patient within the fascial layer which was confirmed by ultrasound.

**Result:** A total number of 40 patients were recruited for this study and were equally divided into two groups. Thus 20 patients were in the group I and the rest 20 patients were in group II. The mean age of group I were  $53.08 \pm 4.25$  and group II were  $51.5 \pm 4.97$  ( $p = 0.286$ ). In this study 5(25.0%) patients had nausea in group I and 8(40.0%) in group II, 3(15%) patients had vomiting in group I and 4(20.0%) in group II ( $p > 0.05$ ). The mean first analgesic demand was  $8.39 \pm 1.85$  hours in group I and  $1.59 \pm 0.21$  hours in Group II ( $p = 0.001$ ). The mean total morphine consumption was  $14.78 \pm 3.56$  in group I and  $26.30 \pm 5.9$  in group II ( $p < 0.05$ ).

**Conclusion:** TAP block effectively reduced the total postoperative morphine consumption

**Keywords:** Effectiveness; transversus abdominis plane block; multimodal analgesia; opioid consumption; total abdominal hysterectomy; RCT.

## Introduction

Multimodal analgesia is the use of a variety of analgesic drugs as well as the techniques<sup>1</sup>. These are working with different mechanisms of action in the peripheral or central nervous system or on both system. These includes nonsteroidal anti-inflammatory drugs, local anesthetics, peripheral nerve blocks, gabapentinoids, and alpha2 adrenergic agonists. Any combination of these therapies can help to reduce the surgical stress responses and improves patient outcomes such as pain control, patient satisfaction, time to discharge, and return to daily activities<sup>2</sup>. Use of combination with more than one drug acts by additive or synergistic effects and they acts at different receptors. These also decreased opioid consumption compared with use of a single medication administered through one technique. In general, the use of local anesthetic-based regional anesthesia techniques for surgical procedures of the extremities, abdomen, and thorax is encouraged<sup>3</sup>.

Abdominal field blocks have been used as a part of multimodal analgesia for post-operative pain control in abdominal surgery. Formerly these blocks were given blindly<sup>4</sup>. The transversus abdominis plane (TAP) block is a technique of regional anaesthesia that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall<sup>5</sup>. There is a fascial sheath between the internal oblique and transversus abdominis muscles and the nerves lie deep to this fascia. Ultrasound imaging assists accurate location of the transversus abdominis plane compared with a technique that relies on anatomical landmarks with acknowledged variability<sup>6</sup>. This present study was undertaken to observe the effectiveness of transversus abdominis plane block as part of a multimodal analgesia to reduce opioid consumption among total hysterectomy patients.

## Methodology

**Study Population & Settings:** This was a prospective randomized control trial study. This study was conducted in Department of Anaesthesia, Analgesia, Palliative and Intensive Care Medicine of Dhaka Medical College and Hospital, Dhaka, Bangladesh. This study was carried out from March 2016 to September 2018

for a period two years and six months. All women booked for a elective total abdominal hysterectomy under general anesthesia were selected as study population. Women with the history of allergy to bupivacaine or morphine, history of opioid addiction, patients with coagulation disorders, infection at the needle insertion site or patient refuse to give informed consent to be part of the trial.

**Recruitment and Enrollment:** The detail of the study (purpose, methods, VAS scoring system, effects and complications of the procedure) were discussed with the patient who qualified for the trial during preoperative visit which was done the day before surgery. Then participants are selected after completing the inclusion and exclusion criteria. Finally written informed consent were taken from them if they agreed to take part in the trial.

**Randomization:** A total 40 participants were selected and randomly divided into two groups designed as group I and group II by using fixed number sealed envelope technique. Each group contains 20 patients. This grouping was made by assigned anaesthesiologist and given the code number for every patient.

**Intervention:** Patient of both group were given general anesthesia. A routine general anesthesia was performed using the standard technique. After 3 minute pre-oxygenation fentanyl 2 microgram/kg and thiopental sodium 3 to 5 mg/kg were used for induction. For intubation vecuronium 0.1mg/kg was given. Anesthesia was maintained with halothane 0.6 MAC, N<sub>2</sub>O 66%, O<sub>2</sub> 33% and incremental dose of vecuronium 0.03 mg/kg when needed. After completion of operation and skin closure TAP block (with the help of USG guidance) was given to all patient. Group I patient received 20 ml 0.25% bupivacaine and group II patient received 20 ml normal saline as placebo. Then dressing was done. Finally 20 patient was reversed after fulfilling the reversal criteria with neostigmine 50 microgram/kg & 20 microgram/kg atropine. The TAP block was performed after taking all aseptic precaution in the flank palpated between the 12th rib (Costal margin) and the iliac crest. The neuromuscular plane between the internal oblique muscle and the transversus abdominis muscle was identified with

ultrasound guidance. Atraumatic bluntneedle for peripheral nerve block (Sono Ned, 21G, 110mm length) was advanced by an ultrasound guided in-plane technique at the anterior axillaryline. The first “pop” sensation should be felt as the needle reaches the fascialplane between the external oblique and internal oblique muscles. A second “pop” sensation should be felt as the needle enters in the plane between internaloblique muscle and transversus abdominis muscle. The exact location of the needle tip was confirmed via direct ultrasound visualization. After confirmation of the correct position of the needle and negative aspiration, 1 to 2 ml of normal saline was injected to identify position with water dissection. After confirmation of correct position, 20 ml 0.25% bupivacaine was given to group I patient and 20 ml normal saline was given to group II patient within the fascial layer which was confirmed by ultrasound. Study drug were prepared and labeled properly. In postoperative room all patients were receive injparacetamol 1gm IV stat and 6 hourly and diclofenac sodium 50 mg P/R stat and 8 hourly. Time of first demand of analgesic was then recorded. To all patients ondansetron 8mg IV was given along with 1<sup>st</sup> dose of Morphine.

**Follow up and Outcomes Measures:** The presence and severity of pain were assessed using a visual analogue pain scale (VAS) and continued it at 2 hour interval up to 24 hours and in between 2 hour whenever patient complains about pain. Morphine 0.15mg/kg intramuscular were given when patient complains pain according to VAS score 6 or above 6 (rest/ Movement). Total morphine requirements were documented. Incidences of nausea & vomiting were also being recorded.

**Statistical Analysis:** Statistical analyses were carried out by using the Statistical Package for Social Sciences version 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Unpaired student t-test was used for continuous variables like age, weight, morphine requirement, frequency of morphine required and first analgesic demand. Chi-Square test was used to analyze the categorical variables like occurrence of nausea & vomiting. P values <0.05 was considered as statistically significant.

## Result

A total number of 40 patients were recruited for this study and were equally divided into two groups. Thus 20 patients were in the group I and the rest 20 patients were in group II. Then TAP block with 20 ml of 0.25% bupivacaine in group I and 20 ml normal saline in group II on each side was done before surgical dressing. Monitoring of time of first analgesic demand, frequency of morphine and total morphine consumption was observed in 24 hour post-operative period. The mean age of group I were  $53.08 \pm 4.25$  and group II were  $51.5 \pm 4.97$ , which was statistically non-significant ( $p = 0.286$ ) and mean weight (Kg) of group I patient were  $57.58 \pm 7.21$  and group II were  $61.45 \pm 6.4$  which was also statistically not significant ( $p = 0.080$ ) (Table 1).

**Table 1** Demographic characteristic of the patients (Mean $\pm$ SD)

Variables	Group I	Group II	P value
Age (in years)	$53.08 \pm 4.25$	$51.5 \pm 4.97$	0.286
Weight (kg)	$57.58 \pm 7.21$	$61.45 \pm 6.4$	0.080

Student t test was performed to see the level of significance.

The morphine requirement in group I was  $1.75 \pm 0.44$  mg and group II was  $2.85 \pm 0.48$  mg. Here p value was 0.001 which is statistically significant (Table II).

**Table 2** Frequency of morphine requirement in different group (Mean $\pm$ SD)

Groups	Value (mg)	P value
Group I	$1.75 \pm 0.44$	0.001
Group II	$2.85 \pm 0.48$	

Student t test was performed to see the level of significance.

It was observed that 5(25.0%) patients had nausea in group I and 8(40.0%) in group II, 3(15%) patients had vomiting in group I and 4(20.0%) in group II. The difference was statistically not significant ( $p > 0.05$ ) between two groups (Table III).

**Table III** Occurrence of adverse Events in different group

Adverse Events	Group I	Group II	P value
Nausea	5(25.0%)	8(40.0%)	0.311
Vomiting	3(15.0%)	4(20.0%)	0.677

Chi square test was performed to see the level of significance.

The mean first analgesic demand was 8.39±1.85 hours in group I and 1.59±0.21 hours in Group II. The difference was statistically significant between two groups (p=0.001) (Table IV).

**Table IV** Time of First Analgesic Demand after the End of Operation (Mean±SD)

Groups	Value (Hour)	P value
Group I	8.39±1.85	0.001
Group II	1.59±0.21	

Student t test was performed to see the level of significance.

It was observed that the mean total morphine consumption was 14.78±3.56 in group I and 26.30±5.9 in group II. The difference was statistically significant (p<0.05) between two groups. Morphine requirement was significantly high in group II patients (Table 5).

**Table V:** Total Morphine Consumption in 24 hour Post-Operative Period (Mean±SD)

Groups	Value (mg)	P value
Group I	14.78±3.56	0.001
Group II	26.30±5.9	

## Discussion

Patients for elective total abdominal hysterectomy under general anaesthesia were recruited into this prospective, randomized, controlled study. TAP block was done with 20 ml of 0.25% bupivacaine in trial group and 20 ml normal saline in control group on each side as a part of multimodal analgesia to the anterior abdominal wall. This study carried out with the aim to measure and

compare the post-operative opioid requirement, time to first analgesic demand and also to see the incidence of nausea & vomiting.

In this study TAP block in patients with elective total abdominal hysterectomy under general anaesthesia found that the mean time to first analgesic demand was delayed in group I than in group II. The difference was statistically significant (p<0.05) between two groups. McDonnell et al<sup>7</sup> used TAP block in patients undergoing colonic resection surgery involving a midline abdominal wall incision, McDonnell et al<sup>7</sup>, Jadon et al<sup>8</sup>, Belavy et al<sup>9</sup> done TAP block in patients undergoing cesarean delivery and Atim et al<sup>10</sup> and Carney et al<sup>1</sup> also have given TAP block in patients undergoing total abdominal hysterectomy. Above all studies which is similar to this study. Both of them showed that mean time to first analgesic demand were delayed.

In this current study, it was observed that occurrence of nausea and vomiting in between two group was statistically non-significant. Carney et al<sup>1</sup> did not find any significant difference regarding PONV. Nirajet al<sup>11</sup> showed that TAP block did not influence on PONV. Siddiqui et al<sup>12</sup> found no significant difference in post-operative nausea and vomiting between the TAP and non-TAP block group. Mrunaliniet al<sup>13</sup> also showed that there is no relation between TAP block with nausea and vomiting.

In this study frequency of morphine in group I patient was lower than group II patient which was statistically significant. There was no previous study regarding frequency of morphine consumption. This observation maybe due use of continuous IV PCA device for opioid delivery in other studies.

Atimet al<sup>10</sup> have concluded that opioid requirement is less in ultrasound-guided TAP block after TAH than superficial wound infiltration. McDonnell et al<sup>7</sup> showed that TAP block reduce mean IV morphine requirements more than 70%. Prabu et al<sup>14</sup> showed that TAP block had significantly reduced post-operative morphine consumption at 2,4 and 6 h and also reduced the mean morphine requirement by 57%. Ra et al<sup>15</sup> showed that USG-TAP block could reduce the amount of opioid during operation and 24 hour post-operative period after laparoscopic



cholecystectomy. TAP block is effective as a part of a multimodal analgesia for reducing postoperative pain and opioid requirement after emergency laparotomy<sup>13</sup>. TAP block reduces postoperative morphine usages when compared with PCA alone which has been performed by Riset al<sup>16</sup> and have showed that USG guided TAP block is effectively reduced the total opioid consumption. In this study also similar observation is observed.

### Conclusion

In conclusion the transversus abdominis plane block is effective as part of a multimodal analgesia to reduce opioid consumption among total hysterectomy patients. Thus, TAP block reduces the total postoperative morphine consumption. Moreover, the adverse events are very minimum among these patients.

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