

# Comparison of Bupivacaine and Dexmedetomidine versus Bupivacaine Alone in Transversus Abdominis Plane Block for Post-Operative Analgesia

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## Author's Contribution

<sup>1,2</sup> Conception of study  
<sup>1,2</sup> Experimentation/Study conduction  
<sup>1,2,3,5,6</sup> Analysis/Interpretation/Discussion  
<sup>1,2,3,4</sup> Manuscript Writing  
<sup>1,3,4,5,6</sup> Critical Review  
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## Abstract

**Objective:** To study the effects of adding dexmedetomidine to bupivacaine in transversus abdominis plane block in comparison with using bupivacaine alone.

**Materials and Methods:** This was a prospective comparative study that was conducted in the Anaesthesia Department, CMH, Lahore over a period of six months from 1<sup>st</sup> June 2020 to 30<sup>th</sup> November 2020. Fifty patients of the American Society of Anesthesiologist Class I and II with an age range between 40 to 60 years were divided into two groups. Group B received 20ml of 0.25% bupivacaine with 2ml of normal saline on each side in the transversus abdominis plane block while group BD was given 20ml of 0.25% bupivacaine with dexmedetomidine 0.5mcg/kg on each side (in a volume of 2ml). Post-operative pain was assessed with a visual analogue scale. Rescue analgesia was given when a score of greater than 3 was observed using this scale. Time to first rescue analgesia was noted. Total opioid consumption in the first 24 hours was also recorded. Patients were observed for postoperative hypotension and bradycardia.

**Results:** The mean-time for the first dose of analgesia for group B and BD was 302.92 ± 24.01 and 419.28 ± 31.97 minutes respectively with a p-value of 0.001. The mean of the total consumption of opioids in 24 hours post-operatively for group B and BD was 14.20±2.36 and 10.40±1.38 mg respectively with a p-value of 0.001. Hypotension was not seen in any patient in either group. Only one patient developed bradycardia and he belonged to group BD. P-value was 0.327.

**Conclusion:** The addition of dexmedetomidine to bupivacaine for transversus abdominis plane block for postoperative analgesia significantly prolongs the duration of analgesia and reduces the postoperative opioid requirements.

**Keywords:** Dexmedetomidine, Post-operative analgesia, TAP block, Total abdominal hysterectomy.

## Introduction

Enhanced recovery after surgery (ERAS) protocol aims to reduce the length of hospital stay, reduction in postoperative complications, and early recovery to normal life for the patient.<sup>1</sup> Adequate control of postoperative pain is a major element for early recovery.<sup>2</sup> Abdominal hysterectomy is a major non-obstetric gynecological surgery in women where pain has traditionally been controlled by opioids mainly. However, reducing the consumption of perioperative opioids is a cornerstone for early recovery after surgery.<sup>3</sup>

Transversus abdominis plane (TAP) block involves the spread of local anesthetic in the neurovascular plane between the internal oblique and transversus abdominis muscle thus blocking abdominal wall afferent nerve fibres.<sup>4</sup> It has proved to significantly reduce pain after abdominal surgeries.<sup>5</sup> However one major limitation of TAP block is that it only covers the somatic component of pain and provides no efficacy for a visceral component.<sup>6</sup>

Various adjuvants have been tried with bupivacaine for TAP block to prolong the duration, provide quality analgesia and reduce postoperative opioid requirements. These include clonidine, magnesium sulphate<sup>7</sup>, ketorolac, and dexmedetomidine.<sup>8</sup>

Dexmedetomidine<sup>9</sup> is an alpha 2 adrenoceptor agonist. The exact mechanism by which alpha 2 agonists produce analgesia is not fully understood. However, it acts both at peripheral receptors and receptors in the brain thus inhibiting the propagation of pain signals and providing sedation respectively. It also has a vagomimetic action, by virtue of which it can cause bradycardia and hypotension when given in intravenous boluses. Fortunately, this effect is either very minimal or absent when it is used intrathecally or for peripheral nerve blocks.

Ultrasound-guided TAP block is recently been used in Pakistan for postoperative pain control after abdominal hysterectomy. We aim to see the effects of adding dexmedetomidine to bupivacaine for postoperative pain control and opioids consumption after abdominal hysterectomy.

## Materials and Methods

This was a prospective comparative study that was conducted in the Anaesthesia Department, CMH, Lahore over a period of six months from 1st June 2020 to 30th November 2020. Approval from the

institutional ethical review committee was taken before commencement of the study (ERC Reference letter number. 577/2020/Trg/Adm). Patients with an age range between 40 to 60 years with the American Society of Anesthesiologists (ASA) class of I and II undergoing abdominal hysterectomy were included in this study. Patients having coagulopathy, liver disease, morbid obesity, infection at the site of injection, previous abdominoplasty, allergy to local anesthetics, or those with chronic use of analgesics and those unwilling to participate in the study were excluded from the study.

A total of fifty patients were included in the study. G\*Power 3 software version 3.1.9.710 was used to calculate the sample size with a power of 80% to detect an effect size of 0.8 in the outcome measures of interest, assuming a type I error of 0.058. They were randomly divided into two equal groups. Group B received bupivacaine only in TAP block and group BD received bupivacaine with dexmedetomidine. Visual analogue scale (VAS) was explained to all patients on the day of pre-operative assessment where 0 signified 'no pain' while 10 signified 'worst pain'.

Written consent was taken from all the patients who were willing to participate in the study. Patients were monitored with standard monitoring protocols of the hospital which included pulse-oximetry, electrocardiography (ECG), non-invasive blood pressure (NIBP), capnography, and temperature. All patients were premedicated with midazolam 0.03mg/kg, ondansetron 0.1 mg/kg and dexamethasone 4 mg intravenously (IV). General anesthesia was induced with propofol 1-2mg/kg and atracurium 0.5 mg/kg. An endotracheal tube was placed and tracheal intubation was confirmed by bilateral chest auscultation and capnography. Anesthesia was maintained with isoflurane 1-2 minimum alveolar concentration (MAC) and oxygen. Nalbuphine 0.01 mg/kg and acetaminophen 15 mg/kg was given intravenously for analgesia. After the surgery, a TAP block was performed in both groups under ultrasound guidance by one of the researchers. Group B received 20 ml of 0.25% bupivacaine with 2 ml of normal saline on each side while group BD was given 20 ml of 0.25% bupivacaine with dexmedetomidine 0.5mcg/kg (in a volume of 2 ml) on each side. In all patients, residual neuromuscular blockade was reversed with neostigmine and glycopyrrolate. All patients were extubated fully awake after adequate reversal of neuromuscular blockade.

VAS was used to assess the severity of pain. Injection nalbuphine 5 mg was given intravenously as rescue analgesia when VAS  $\geq 4$ . Time to first rescue analgesia was noted. Total opioid consumption for the first 24 hours was also recorded. Patients were observed for postoperative hypotension and bradycardia. Hypotension was labeled when the MAP of the patient was reduced by 20% of baseline MAP. Bradycardia was labeled when the HR of the patient dropped below 50 beats/minute. The baseline heart rate (HR) and mean arterial pressure (MAP) of all patients were recorded before the TAP block. HR and MAP were recorded hourly for the first four hours and then five hourly for the next 20 hours. Patients were treated with a bolus of 5 mg ephedrine intravenously if they developed bradycardia and hypotension.

Data were analyzed using the program, statistical package for social sciences (SPSS) version 24. Demographic data including name, age, body mass index (BMI), and contact were noted on a specially designed proforma. Quantitative variables like age and BMI and were measured in the form of mean  $\pm$  SD (Standard Deviation). Qualitative data like ASA class was expressed as a percentage. Both groups were

compared by using independent-Sample T test-taking p-value  $< 0.05$  as statistically significant.

## Results

The demographic data of both groups were comparable. The age range of the patients who participated in this study was from 43 years to 60 years with a mean and standard deviation of  $52.64 \pm 4.67$  years. The mean and standard deviation in group B was  $51.80 \pm 5.12$  years, while it was  $53.48 \pm 4.11$  years in group BD with a p-value of 0.207. Out of fifty patients, 16 (32%) were ASA I while 34 (68%) were ASA II. In group B out of twenty-five, 10 (40%) patients were ASA I while 15 (60%) were ASA II. In group BD out of twenty-five, 6 (24%) patients were ASA I while 19 (76%) were ASA II. P-value was 0.230. The mean and standard deviation of BMI in group B was  $25.12 \pm 1.66$  kg/m<sup>2</sup>, while for group BD it was  $25.64 \pm 1.65$  kg/m<sup>2</sup> with a p-value of 0.274. A detailed comparison is shown in Table 1.

**Table 1: Comparison of Demographic Data of Both Groups**

Age (Years)	Group B	Group BD	P-value
Mean $\pm$ SD of age (years)	$51.80 \pm 5.12$	$53.48 \pm 4.11$	0.207
Mean $\pm$ SD of Body Mass Index (kg/m <sup>2</sup> )	$25.12 \pm 1.66$	$25.64 \pm 1.65$	0.274
Frequency (%) of the American Society of Anesthesiology (ASA) Status	ASA I	10 (40%)	0.230
	ASA II	15 (60%)	

A significant difference was noted in post-operative analgesia requirements in both groups. Group BD patients required their first dose of analgesia significantly later than those of group B. Similarly, the total analgesic requirement in group BD patients was significantly less as compared to group B patients. A detailed comparison is shown in Table 2.

**Table 2: Comparison Of Postoperative Analgesia Requirement in both groups**

Analgesic requirement	Group	Mean $\pm$ Standard Deviation	P-value
Time of 1 <sup>st</sup> Dose of Analgesia	B	$302.92 \pm 24.01$ Minutes	0.001
	BD	$419.28 \pm 31.97$ Minutes	
Nalbuphine consumption in 1 <sup>st</sup> 24 hours	B	$14.20 \pm 2.36$ mg	0.001
	BD	$10.40 \pm 1.38$ mg	

There was an insignificant difference in hemodynamic parameters in both groups. Hypotension was not seen in any patient in either group. Hypotension wasn't seen in any group, whereas only 1 (4%) patient had bradycardia in group BD with a p-value of 0.327.

## Discussion

Transversus abdominis plane block was first demonstrated by Dr. Rafi AN in the year 2001.<sup>11</sup> He used the surface landmarks technique to give single-shot local anesthetics in transversus abdominis plane through an angle of Petit. Later in 2007, Hebbard P et al. described the TAP block under ultrasound guidance.<sup>12</sup>

In our study, we observed that adding adjunct dexmedetomidine to bupivacaine for TAP block provides excellent postoperative analgesia in patients who underwent hysterectomy under general anesthesia. It did not only delay the first rescue analgesia requirement but also significantly reduced the first 24 hours consumption of opioids. A study conducted by Almarakbi WA et al. demonstrated similar results to that of our study.<sup>8</sup> In a similar study conducted by Elhamamy N et al<sup>13</sup> compared the effects of TAP block in four different groups. Group one received saline placebo, group two received bupivacaine, group three received bupivacaine with dexmedetomidine, and group four received bupivacaine with dexamethasone. They observed that the addition of both dexamethasone and dexmedetomidine as an adjunct to local anesthetic in TAP block improves the quality and duration of analgesia but dexmedetomidine was superior to dexamethasone in this regard.

Various other studies have shown that adding dexmedetomidine to local anesthetics can prolong the duration and provide better quality analgesia as compared to local anesthetics only.<sup>14-17</sup>

In our study, no patient developed post-operative hypotension from either group but one patient developed postoperative bradycardia in group BD. Conflicting results were seen in a study conducted by Almarakbi WA et al.<sup>8</sup> They observed significant bradycardia in group BD during the first four postoperative hours.

Contrary to our results, Ding W et al. concluded in their study that the addition of dexmedetomidine to local anesthetic does not significantly prolong the duration or improve the quality of analgesia of TAP block.<sup>18</sup>

The field of anesthesiology has made huge advancements in the last few decades. The introduction of regional blocks including TAP block and various adjuncts for regional blocks have dramatically improved patient satisfaction, allowed early ambulation, and shorter hospital stays. TAP block brings another addition to the repertoire of

multimodal analgesia for anesthesiologists for various abdominal surgeries. We encourage the use of this underutilized modality. However, further research and experience for the safe use of this technique and optimum dosage of dexmedetomidine for TAP block is required.

## Conclusion

It was concluded in our study that the addition of dexmedetomidine to bupivacaine for TAP block for postoperative analgesia significantly prolongs the duration of analgesia and reduces the postoperative opioid requirements.

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