



## COMPARISON OF THE EFFECT OF TRANSVERSUS ABDOMINIS PLANE BLOCK AND LOCAL INFILTRATION WITH BUPIVACAINE FOR POSTOPERATIVE ANALGESIA IN CAESAREAN SECTION

### Anaesthesiology

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### ABSTRACT

**BACKGROUND:** Wound infiltration and abdominal nerve blocks have been used to provide post caesarean section analgesia. In our study we aim to compare the efficacy of providing post caesarean section analgesia between ultrasound (US) guided Transversus Abdominis Plane (TAP) block and wound infiltration.

**METHODS:** The study was conducted on 100 patients undergoing caesarean section who were divided into group A and B. Group A received a US guided TAP block and group B received surgical site infiltration with 1.5mg/kg of 0.25% bupivacaine following caesarean section. Patient's Visual Analog Scale, heart rate, blood pressure, pulse oximetry, time to first rescue analgesia and post-operative complications were noted.

**RESULTS:** Postoperatively VAS scores were higher in group B than in group A and time to rescue analgesia was longer in group A.

**CONCLUSIONS:** We conclude that ultrasound guided TAP block provides better and longer lasting post caesarean section analgesia.

### KEYWORDS

Transversus Abdominis Plane Block, local infiltration, postoperative pain relief

### INTRODUCTION

With the increasing trend towards caesarean section (C/S) deliveries worldwide (OECD (Paris), 2017) it is becoming increasingly important to focus our attention at providing post C/S pain relief. If left untreated post-operative C/S pain can hamper the bonding between mother and child and early breast feeding. In comparison to women with mild postpartum pain those with intense acute postpartum pain have an increased risk of postpartum depression. (Eisenach et al., 2008) In addition women with severe acute post-operative pain have a higher risk for chronic post-surgical pain following C/S. (Jin et al., 2016) C/S pain arises in part due to the incision over the anterior abdominal wall. Local anesthetic wound site infiltration and abdominal nerve blocks have both been used to provide post C/S pain relief. (Bamigboye & Hofmeyr, 2010) The Transversus Abdominis Plane (TAP) block have recently emerged as a good regional analgesic technique for abdominal procedures as it blocks neural afferents between T6 to L1 thereby providing analgesia to the parietal peritoneum, skin and muscles of the anterior abdominal wall. (Charlton, Cyna, Middleton, & Griffiths, 2010) In TAP block the local anesthetic is deposited in the plane between the internal oblique and transversus abdominis muscle wherein lies the neural afferents between T6 to L1. (Tsai et al., 2017) Accuracy of placement of the local anaesthetic during TAP block can be increased by using ultra sonographic guidance.

In our study we aim to compare the efficacy of providing post C/S analgesia between TAP block and surgical incision site infiltration with bupivacaine.

### MATERIALS AND METHODS

The randomized prospective study was conducted after obtaining the approval of the institution ethics committee. A written informed consent was taken from all the patients. Patients of American Society of Anaesthesiologists (ASA) grade I and II posted for caesarean section, within the age group of 18 to 40 years, weighing more than 40 kgs, with singleton pregnancy and who could comprehend Visual Analog Scale (VAS) were included in the study. Those patients with coagulopathy, allergy to local anesthetics, infection at puncture site or previous abdominal surgeries were excluded from the study.

All the selected patients were randomly divided into two groups A and B of 50 participants each. Group A patients received an US guided bilateral TAP block with 1.5mg/kg of 0.25% bupivacaine after skin closure following caesarean section. In group B the patients received surgical incision site infiltration with 1.5mg/kg of 0.25% bupivacaine at the end of surgery.

Preloading with ringer lactate at a rate of 15ml/kg was carried out.

Each patient received spinal anaesthesia using 10mg of 0.5% hyperbaric bupivacaine. They were placed in the sitting position and the midline approach through the L3- L4 intervertebral space was used. Only patients with successful spinal anaesthesia were included in the study.

Perioperatively all patients were continuously monitored for heart rate (HR), non-invasive blood pressure (NIBP) and pulse oximetry (SPO2). Presence of post-operative pain was also assessed. Post-operative pain was evaluated using the visual analog scale (VAS) a scale of one to ten. The patients were asked to provide a number, with ten being the most violent pain they had ever had experienced and zero being no sensation of pain. These parameters were also assessed immediately post operatively and thereafter every thirty minutes for the first three hours followed by the fourth, sixth, eighth, twelfth and twenty fourth hours.

After completion of the surgical procedure group A patients received an ultrasound (ESAOTE MY LAB ONE EUROPE BV, MOD 8100) guided bilateral TAP block using 18G Tuohy's needle. The inplane technique was used to visualize the entire needle until it entered the transversus abdominis plane between the internal oblique and transversus abdominis muscle. Upon reaching the plane 2ml saline was injected to confirm needle position. After confirmation 1.5mg/kg of 0.25% bupivacaine was injected. In group B at the end of the surgery 1.5 mg/kg of 0.25% bupivacaine was used for subcutaneous infiltration of the patient's surgical incision site.

Patients of either group with a VAS score of five or more were given rescue analgesic using injection diclofenac sodium at a dose of 1.5 mg/kg intramuscularly (IM). If the VAS score was still five or more one hour later then injection tramadol 1 mg/kg IM was administered. Time to first rescue analgesia was recorded from the completion of TAP block/surgical site infiltration to first analgesic dose.

Any complications like nausea, vomiting, bradycardia, hypotension or headache were recorded and were treated accordingly.

Data was entered and prepared using Microsoft Word and Microsoft Excel 2007 (Microsoft Corporation USA). Demographic variables and VAS score were analysed statistically using unpaired t test.

### RESULTS

100 patients were included in the study. 50 patients allotted to group A received post-operative TAP block using 1.5 mg/kg of 0.25% bupivacaine bilaterally. 50 patients allotted to group B received surgical incision site infiltration using 1.5mg/kg of 0.25%

bupivacaine. In this study the demographic parameters (Table 1) and body weight were similar in both groups (p value>0.05)

**Table 1: Comparison of demographic variables in the two study groups.**

Demographic Variable	Group A (TAP Block)	Group B (Surgical site Infiltration)	P value
	Mean (SD)	Mean (SD)	
Age (years)	27.28 (±5)	25.44 (±4.9)	0.066
Body Weight (Kg)	57.72 (±6.8)	56.34 (±7.6)	0.342

Data shown as mean ± standard deviation (SD)

The above table shows that the distribution of demographic variables in the two study groups is not significant with p value > 0.05 showing that two groups were similar.

Statistical analysis shows that group B had significantly higher heart rate and mean blood pressure than group A (Table 2 and 3) from 90th minute after administration of bupivacaine (p value<0.05).

**Table 2: Comparison of heart rate with time in the two study groups.**

Heart Rate	Group A (TAP Block)	Group B (Surgical site Infiltration)	P Value
	Mean (S.D)	Mean (S.D)	
0 minute	92 (±12.4)	88 (±9)	0.057
30 minute	90 (±10.7)	88 (±7.6)	0.141
60 minute	89 (±9.8)	88 (±8.2)	0.552
90 minute	86 (±8.8)	90 (±9.1)	0.043
120 minute	85 (±8.9)	97 (±13)	<0.0001
150 minute	84 (±8.2)	102 (±14.4)	<0.0001
3rd Hr	84 (±9.3)	107 (±12.4)	<0.0001
4th Hr	86 (±9.8)	105 (±13.8)	<0.0001
6th Hr	88 (±10)	116 (±1.7)	<0.0001
8th Hr	90 (±10.9)	-	-
12th Hr	95 (±13)	-	-

Data shown as mean ± standard deviation (SD)

The above table depicts that group B had significantly higher heart rate values from 90th minute of observation.

**Table 3: Comparison of Mean Blood Pressure in the two study groups.**

Mean B.P.	Group A (TAP Block)	Group B (Surgical site Infiltration)	P Value
	Mean (SD)	Mean (SD)	
0 minute	76.8(±6.6)	82.9(±10.5)	0.962
30 minute	81.4 (±9.6)	83.9 (±10.2)	0.207
60 minute	82.1 (±7.1)	84.9 (±10.2)	0.120
90 minute	80.1 (±8.3)	85.9 (±9.7)	0.0019
120 minute	78.5 (±6.8)	86.8 (±10.8)	<0.0001
150 minute	77 (±6.0)	87 (±7.83)	<0.0001
3rd Hr	78.3(6.3)	94.3 (±13.3)	<0.0001
4th Hr	78.7 (±6.6)	98.2 (±17.3)	<0.0001
6th Hr	81 (±7)	114.2 (±3.4)	<0.0001
8th Hr	70 (±29)	-	-
12th Hr	52.2(±41)	-	-

Data shown as mean ± standard deviation (SD)

The above table depicts that group B had significantly higher Mean Blood Pressure values from 90th minute of observation.

Post-operative VAS scores (Table 4) was also significantly higher in group B from 30th minute after administration of bupivacaine with p value<0.05.

**Table 4: Comparison of VAS Scores in the two study groups.**

VAS	Group A (TAP Block)	Group B (Surgical site Infiltration)	P Value
	Mean (SD)	Mean (SD)	
0 minute	1.9 (±0.14)	2 (±0.14)	0.1605
30 minute	1.9 (±0.14)	2.1 (±0.38)	0.0009

60 minute	1.9 (±0.14)	2.4 (±0.64)	<0.0001
90 minute	2.1 (±0.36)	3.1 (±1.3)	<0.0001
120 minute	2.2 (±0.41)	3.6 (±1.5)	<0.0001
150 minute	2.3 (±0.47)	4.4 (±2)	<0.0001
3rd Hr	2.4 (±0.5)	4.9 (±1.8)	<0.0001
4th Hr	2.7 (±0.6)	5 (±1.3)	<0.0001
6th Hr	3.4 (±1.1)	6.3 (±0.5)	<0.0001
8th Hr	4.2 (±1.7)	-	-
12th Hr	5.5 (±1.7)	-	-

Data shown as mean ± standard deviation (SD)

The above table shows significant difference in VAS score in the two groups from 30th minute of observation with higher VAS scores in group B.

Mean time to administration of rescue analgesia ( Table 5) was 9.76 hours in group A and 2.5hrs in group B and the difference was found to be significant ( p value<0.05).

**Table 5: Comparison of time of administration of Rescue Analgesia in the two study groups.**

	Group A (TAP Block)	Group B (Surgical site Infiltration)	P value
	Mean (SD)	Mean (SD)	
Time of Rescue Analgesia (Hours)	9.76 (2.7)	2.5 (0.89)	<0.0001

Data shown as mean ± standard deviation (SD)

The above table shows that the time of administration of Rescue Analgesia in group B was significantly earlier than in the group A.

Two patients in group B and three patients in group A developed post-operative nausea and vomiting. However the difference in the incidence of post-operative nausea and vomiting in both groups was not significant.

**DISCUSSION**

An essential component in the care of the post caesarean section patient is effective post-operative pain control. Inadequate pain control, apart from being inhumane may result in increased morbidity or mortality.(Leung, 2004) Good pain relief will improve mobility and can reduce the risk of thromboembolic disease which is increased during pregnancy.(Marik & Plante, 2008) Pain in the postpartum period can hamper the mother's ability to care for her child and reduce her ability to breast feed effectively. However the pain relief provided to the mother should be safe so that it does not affect the mother's mobility nor does it adversely affect breast fed neonates.(Kealy, Small, & Liamputtong, 2010)

The most commonly used modalities are systemic administration of opioids, either by intramuscular injection or intravenously by patient-controlled analgesia, neuraxial injection of opioid as part of a regional anesthetic for caesarean delivery, local infiltration of surgical area or TAP block.(Ramsay, 2000)

TAP block is an effective modality for providing post op analgesia for patients who have had caesarean section. It is also considered a safe block with a low incidence of complications.(Kahsay, Elsholz, & Bahta, 2017)

A number of studies(Abdallah, Halpern, & Margarido, 2012; McDonnell et al., 2008) have found that TAP block provides superior analgesia compared with placebo for post-operative caesarean section pain. However findings in our study suggests that TAP block provide better pain control even compared to surgical wound site infiltration with local anaesthetics. We found a significant difference in the VAS scores between group A and group B with higher VAS scores in group B being noted from the 30<sup>th</sup> minute of observation onwards.

Group B also had significantly higher heart rate and mean blood pressure from 90<sup>th</sup> minute which might indicate that they experienced pain earlier into the post-operative period.

There was also a significant difference in the mean time to administration of rescue analgesia between the two groups with a prolonged mean time to administration of rescue analgesia in group A as compared to group B. This implies that the patients in group B

experienced pain much earlier than group A.

There was no statistically significant difference in the incidence of post-operative nausea and vomiting.

Randomized trials have also been conducted to compare the analgesic efficacy between the TAP block and surgical wound site infiltration in post-caesarean section women. Aydogmus M T et al (Aydogmus et al., 2014) found the numerical pain score (NPS) values of TAP group to be significantly lower from the second hour onwards. There was also an increased time to first analgesic request in the TAP group. More recently Das N. et al (Das, Shukla, Singh, & Yadav, 2018) using 0.25% ropivacaine found that NPS was lower in the TAP group. There was also statistically significant difference in the time to first rescue analgesia and total amount of analgesic consumed. The results of these RCT's were similar to our study. The analgesic efficacy of TAP block was compared with direct infiltration of local anesthetic into surgical incision in lower abdominal gynaecological surgeries by Vijayalakshmi S et al (Sivapurapu, Vasudevan, Gupta, & Badhe, 2013) who found that the TAP group had lower VAS scores and had increased time to rescue analgesia. PONV was significant in the wound infiltration group.

However Tawfik et al (Tawfik et al., 2017) who also conducted a similar trial using 0.25% bupivacaine 30ml for surgical site infiltration and 40ml for TAP block did not find any significant difference in pain scores or time to first rescue analgesia between the two groups.

A meta-analysis done by Yu et al (Yu et al., 2014) of four randomized control trials (RCTS) comparing TAP versus local anesthetic wound infiltration in lower abdominal surgeries and found that the TAP block group had lower VAS pain scores twenty four hours postoperatively however there was no significant difference in the VAS scores at 2<sup>nd</sup> and 4<sup>th</sup> hour post operatively. There was also no significant difference in the rate of PONV.

Guo et al (Guo, Li, Wang, Zhang, & Ma, 2015) conducted a meta-analysis of nine RCTS comparing TAP block versus local anesthetic wound infiltration for post-operative analgesia. They found TAP block group had significantly lower pain scores at 8 hours and 24 hours post operatively. Incidence of PONV was not significantly different between the two groups. No serious complications were reported in all nine studies.

It has also been found that ultrasound guided TAP block provided effective postoperative analgesia for up to 12 hours post operatively (Cho, Kim, Kim, & Chung, 2013; Siddiqui, Sajid, Uncles, Cheek, & Baig, 2011). Similar findings have been noted in our study with TAP block providing effective post-operative analgesia for up to 12 hours in most patients in that group.

One of the limitations of our study includes the fact that we could not assess the success rate of the TAP block as patients were still under the effect of spinal anesthesia when the block was given. Another limitation is that it was not the same surgeon every time who performed the local anesthetic infiltration which might have a bearing on its effectiveness.

## CONCLUSION:

After analysis of observation and results in the present study, we conclude that USG guided TAP block provides better and a longer lasting postoperative analgesia. Hemodynamic variables were more stable in patients with USG guided TAP block compared to those with local anesthetic wound infiltration. TAP Block is safe and easy to perform.

Thus, we conclude and recommend the use of USG guided TAP Block for postoperative analgesia in patients undergoing caesarean section.

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